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Playa Wetlands and Wildlife on the Southern Great Plains
A Guide to Habitat Management

Nelson (R. Wayne) and Associates, Inc.
Boulder, CO

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PLAYA WETLANDS AND WILDLIFE ON THE SOUTHERN GREAT PLAINS: A GUIDE TO HABITAT MANAGEMENT

Fish and Wildlife Service

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U.S. Environmental Protection Agency

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PREFACE

This report describes management techniques that can be implemented on playa wetlands of the Southern Great Plains to make them more attractive to wildlife and fish. Most techniques can be implemented in conjunction with other farm and ranch operations. In fact, some techniques require the use of agricultural practices to accomplish management objectives. The report is aimed at the wildlife manager, the landowner, and the sportsman. It is the purpose of the report to suggest management options, describe management techniques, and discuss potential costs and benefits of managing playas for wildlife and fish.

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The Texas Waterfowlers Association, Inc. arranged a visit to Mike Smith's farm near Hereford, Texas, where the Smiths are developing a private playa lake managed as a waterfowl refuge. Jim Steiert, Secretary of the Texas Waterfowlers, and the Smith family presented many interesting ideas for leased hunting operations that are compatible with conservation goals. Jim Rogers, from the U. S. Bureau of Reclamation and local chairman of Ducks Unlimited, conducted a tour of playas near Plainview, Texas. Fred Guthery, from the Department of Range and Wildlife Management at Texas Tech University, Lubbock, helped guide the Texas field tour and shared his wide experience with playa wildlife, especially with pheasant habitat management. Chuck Mullins, representing the U. S. Fish and Wildlife Service Regional Office in Albuquerque, New Mexico, contributed from his long familiarity with playa habitats.

Charles Segelquist, Western Energy and Land Use Team, U. S. Fish and Wildlife Service, Fort Collins, Colorado, guided the authors in preparing this document.

INTRODUCTION

Playas are natural surface depressions scattered throughout the Southern Great Plains of the Texas Panhandle and adjoining regions of New Mexico, Colorado, Kansas, and Oklahoma. These depressions have no external drainage; consequently, they act as catch basins when precipitation occurs. Little water is lost to seepage because of impervious clay soils, but since evaporation rates are high, most playas are classed as temporary rather than permanent wetlands.

Playa wetlands have considerable potential for wildlife management. They attract large numbers of wintering waterfowl when filled with water and, when dry, are often densely populated with terrestrial birds and mammals, provided that adequate vegetative cover is present. Wildlife managers generally recommend that playas over 10 acres be managed by one of two ways depending upon existing vegetative cover and land use practices. It is recommended that undisturbed playas with good natural stands of vegetation be maintained as natural areas with protection from overgrazing and modifications that would adversely affect wildlife habitat. Management recommendations for playas already modified for agricultural purposes focus on methods of integrating wildlife management practices with existing agricultural activities. The majority of smaller, dryer playas -- nearly half of all playas are under 10 acres -- have less value to wildlife and are not generally recommended for management.

PROTECTING OUTSTANDING HABITAT

U. S. Soil Conservation Service representatives in the Texas Panhandle believe that consideration by landowners of wildlife needs has been a major factor in preventing some playas from being cropped, grazed, or modified for irrigation water storage (B. Fountain, Deputy State Conservationist, Texas State Office, U. S. SCS, pers. comm.). The decision to protect certain playas in an unmodified or near-natural condition logically depends on a number of physical and biological features. For example, the playa watershed should be large enough, possibly 100 acres or more, to supply the surface runoff needed to flood the basin periodically. Also, the circular zone of Randall clay in the playa bottom should be large enough, perhaps 25 acres or more, to block the seepage of runoff collected over the entire flooded area. A wet meadow plant community occupying one-third or more of the Randall clay zone indicates good potential for wildlife habitat management.

Drainage of irrigation tailwater into a cropland playa promotes taller, thicker, more permanent vegetation than in playas receiving only natural runnoff, and provides more wildlife cover and food (Figure 1). Waste

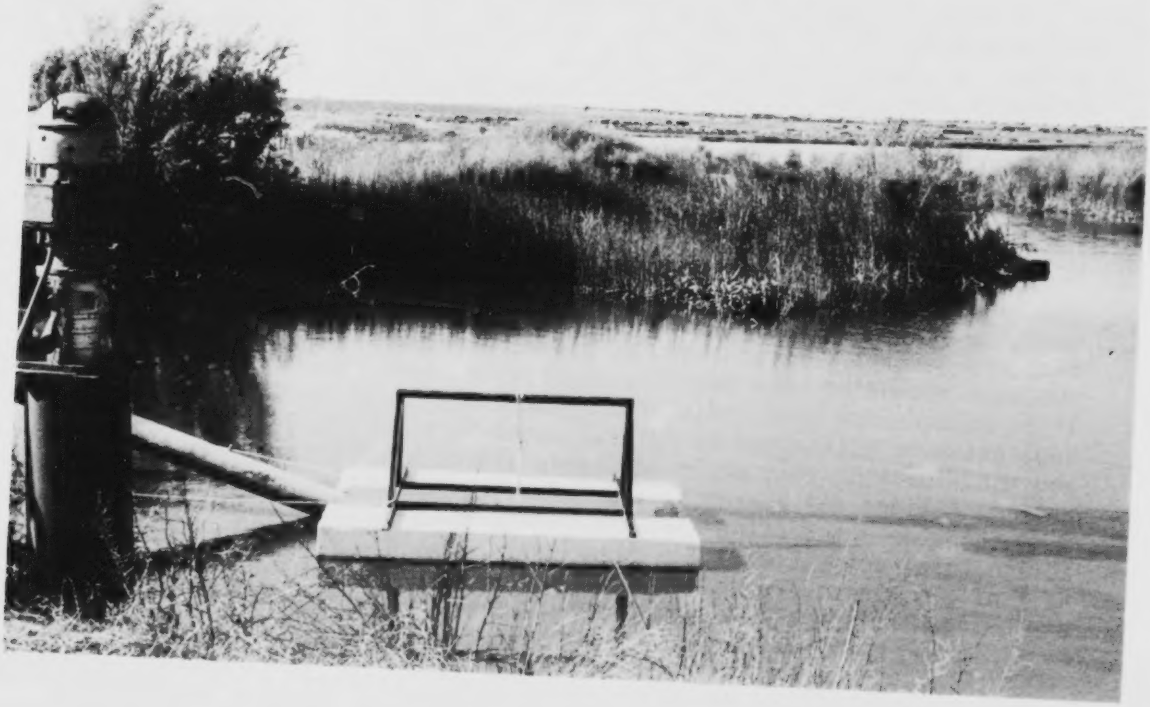

Figure 1. Collection of surface runoff from irrigated croplands and cattle feedlots into playa basins for reuse in irrigation reduces pumping costs and increases open water and cover for wildlife. (Photo by Nelson and Assoc., Inc., Boulder, CO)

grains and stubble available on fields around cropland playas further increase food supplies and cover (Figure 2). A basin surrounded by corn, grain sorghum, and sunflowers, for example, will support more wildlife than one surrounded by cotton, sugar beets, and potatoes. If not disked or plowed, many cropland playas produce superior wildlife cover without any further management effort, except possibly fencing to prevent overgrazing. Only basins of at least 10 acres should be considered for habitat management because smaller cropland playas are normally tilled and operating farm equipment to avoid them is inefficient. In 1980, researchers at Texas Tech University found that only 7% of playas smaller than 10 acres produced "good" wildlife habitat, compared to 29% of larger playas (Guthery and Bryant 1982). About 44% of playas receiving irrigation tailwater provided "good" habitat, compared to 10% of playas lacking tailwater. "Excellent" playa habitat was thought to require permanent surface water or at least 20 acres of tall, persistent plant communities.

It is beneficial to wildlife not to till larger cropland playas, particularly where tailwater adds to natural runoff and increases the amount of open water. Fencing to exclude grazing in these basins will further increase wildlife benefits, especially for pheasants and nesting waterfowl. Possible winter wheat damage by waterfowl, spread of playa weeds into surrounding crops, and control of mosquitoes bred in playas may need to be considered before farming and wildlife habitat management are accepted as compatible.

Rangeland playas generally do not offer as good an opportunity for habitat management as cropland playas because they lack waste grains as a source of wildlife food and irrigation tailwater to support wildlife cover. On the other hand, playas are much more likely to occur in their natural state in rangeland (Figure 3). Therefore, large rangeland basins with adequate moisture from natural runoff might present a good opportunity for habitat preservation merely by fencing the playa basin to prevent grazing. Saline playas, common to the southern fringe of the playa region in Texas and New Mexico, are generally useful only as resting and staging sites for migratory birds, primarily sandhill cranes, and have lower potential for habitat management than freshwater playas.

MODIFICATIONS BENEFITING WILDLIFE

The alternative to protecting and managing unmodified playas as wildlife habitat is to design the modifications often made to playas for agricultural purposes so that wildlife management goals are also met (Figure 4). Most playas modified to concentrate irrigation water storage and reduce evaporation by excavation and diking also have good to excellent wildlife cover. They are beneficial from an agricultural standpoint because tailwater can be recycled for irrigation at less cost than pumping additional ground water. Texas Tech researchers found, in 1980, that 91% of playas intercepting tailwater were modified, while only 29% of playas without tailwater were modifed (Guthery and Bryant 1982). The excavation of at least 15,000 yd^3 of soil is often associated with tailwater drainage and high quality habitat.

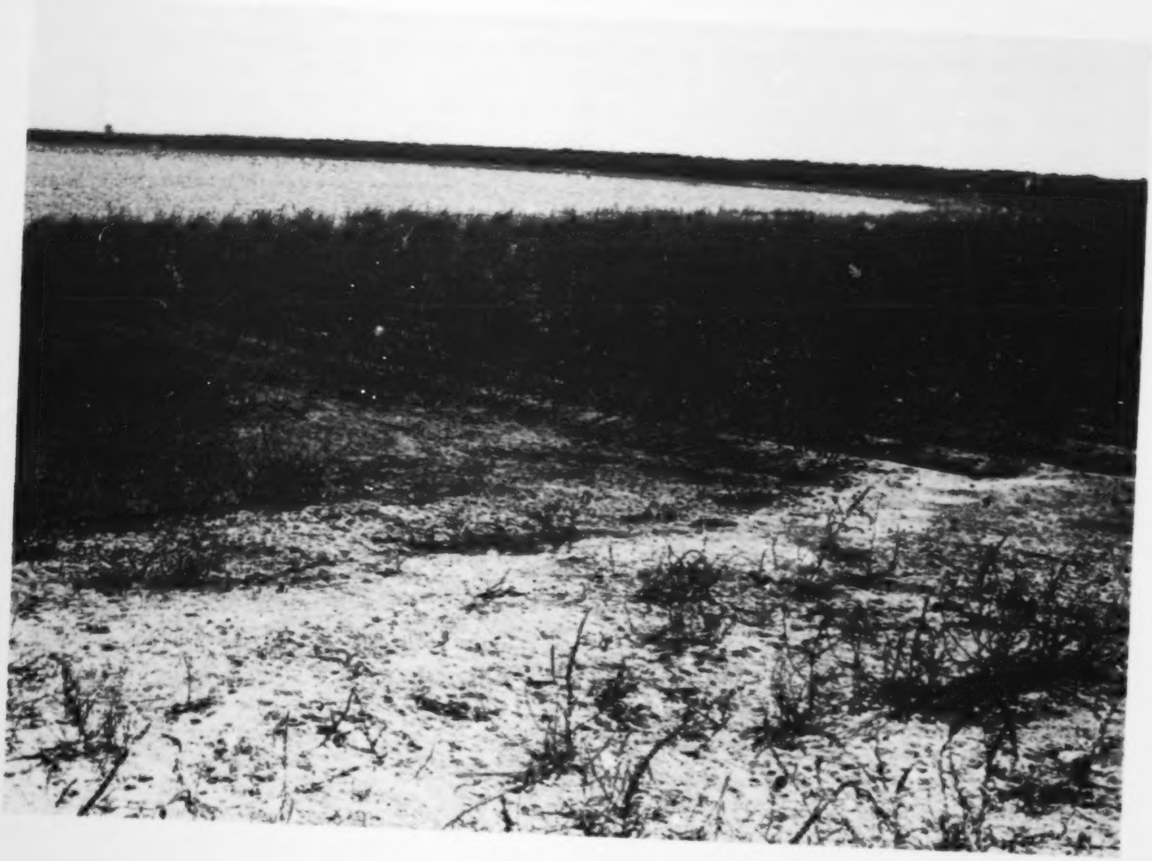

Figure 2. Cropland playa lake with a cotton crop behind the shoreline vegetation, adding to fall wildlife cover. Large open lakes with little emergent vegetation are often preferred by ducks such as pintails. (Photo by Nelson and Assoc., Inc., Boulder, CO)

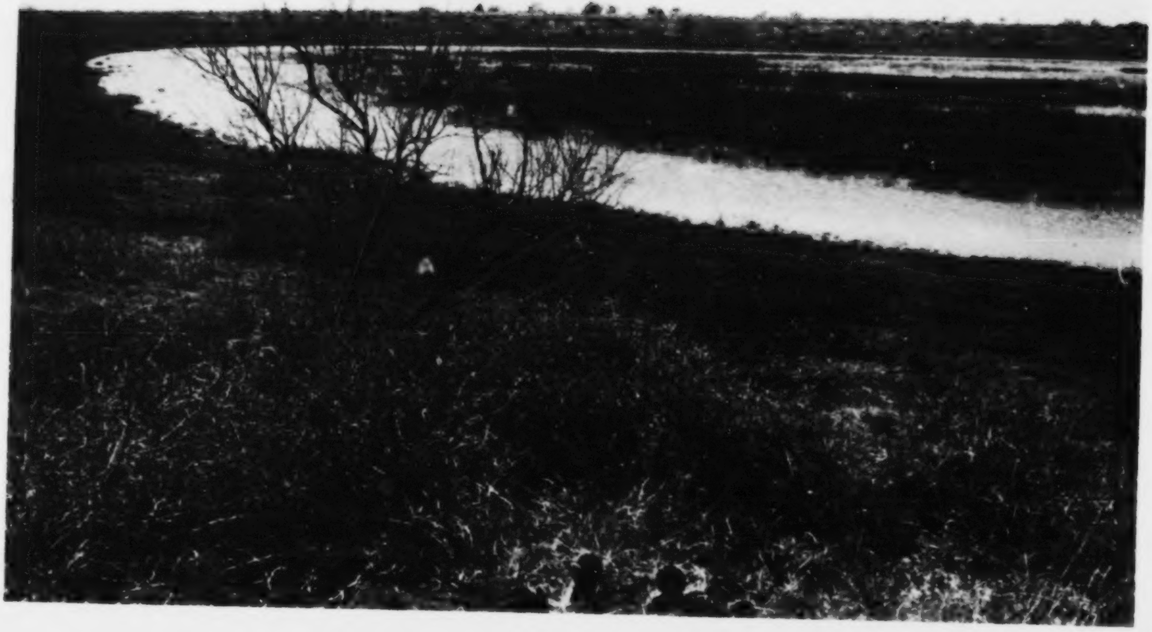

Figure 3. Texas High Plains rangeland playa with a variety of habitat that is attractive to wildlife, including open water, emergent plants, and shoreline brush. This moderate amount of emergent vegetation is preferred by mallard for roosting and escape cover for brooding hens. (Photo by Nelson and Assoc., Inc., Boulder, CO)

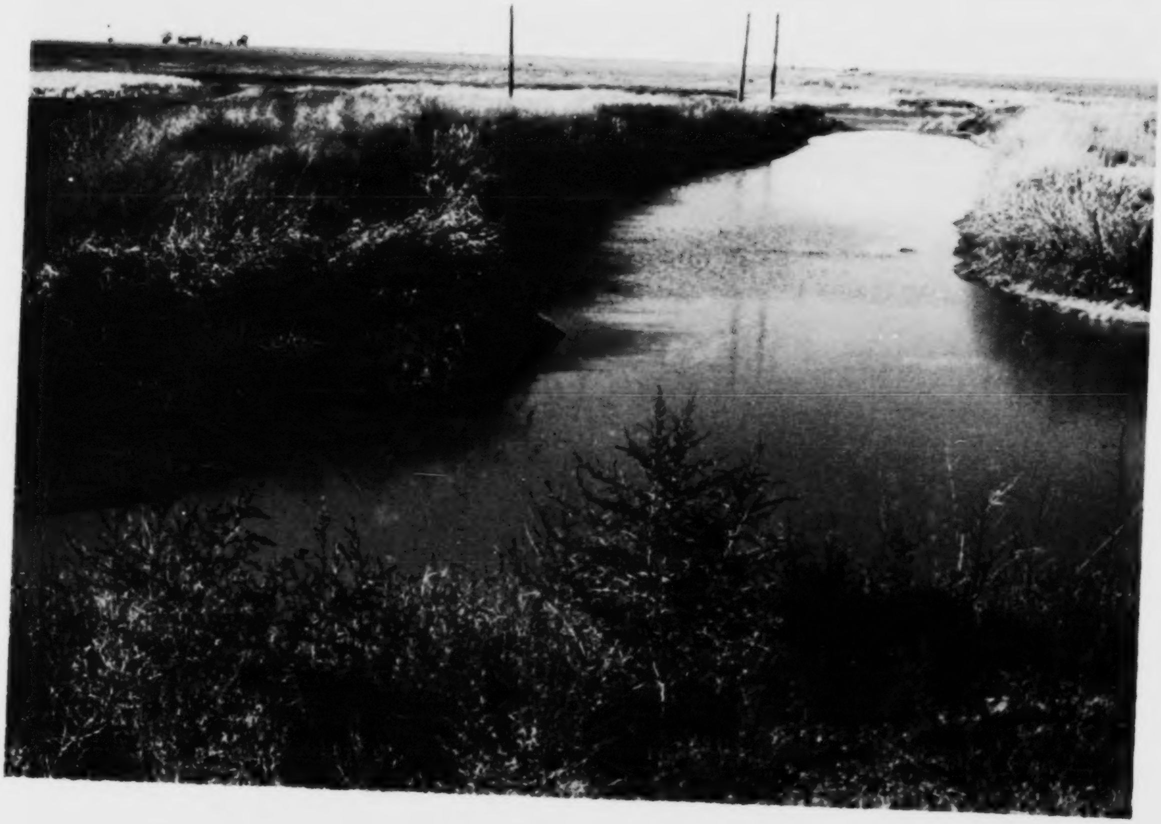

Figure 4. Playa basin excavations for irrigation water storage, with their spoil banks, can create improved terrestrial habitat, particularly for pheasant nesting and raccoon denning. This modified cropland playa also offers increased protection from severe weather. (Photo by Nelson and Assoc., Inc., Boulder, CO)

During years of low rainfall and runoff, basin modifications may favor waterfowl, especially migrant ducks. Unmodified basins are usually dry during these years, and resting sites in the Central Flyway are scarce. At other times the modified playas generally favor upland game birds and other terrestrial wildlife because playa water storage pits drain shallow areas, and open water habitat is decreased. Spoil banks from pit or trench excavation can improve terrestrial habitat, particularly for pheasant nesting and raccoon denning. The tailwater drainage at most modified playas often supports semi-aquatic plants, like cattail and bulrush, which remain standing after the wet season as excellent winter cover for upland wildlife.

Waterfowl production, compared to the resting of migrants, may be higher in the northern Texas Panhandle where rangeland and wheat farming result in less disturbance to playas than in the central Panhandle where row crop production occurs. Modified playas with reduced shallow water areas (littoral zone) supply less natural food and cover for overwintering waterfowl. However, design of irrigation water storage pits and spoil banks with gradually rather than steeply inclined side slopes will help minimize the disadvantages to wildlife.

TARGET WILDLIFE POPULATIONS

One of the most reliable incentives for a farmer, rancher, or other landowner to protect or improve wildlife habitat is an economic one. The potential income from hunters paying fees to trespass on private land and harvest upland game birds or waterfowl can support an economic decision to withdraw certain playas from a cropping or grazing program. Nongame wildlife species may also benefit from habitat management aimed at game populations. For example, management for puddle ducks or geese and cranes may also benefit shore and wading birds, amphibians, fish, and other aquatic life. Management for pheasants and quail or dove may, at the same time, aid songbirds, birds of prey, reptiles, rodents, furbearers, and other wildlife. Five target populations of fish and wildlife are affected differently by eighteen management practices (Table 1). Eight of the eighteen are agricultural practices primarily concerned with crop and livestock production, but capable of benefiting wildlife under certain conditions. Three are public service or industrial practices that may secondarily benefit wildlife. And seven are fish and wildlife practices aimed specifically at fish and wildlife goals.

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Table 1. Relative benefits from various playa management practices for target wildlife population groups.

Management practices	Population groups				
	Migratory waterfowl	Upland game birds	Upland nongame birds, mammals, reptiles	Shore/wading birds, amphibians, aquatic mammals	Fishes
Agricultural practices					
Crops and residues managed as wildlife food and cover	H[a]	H	M[b]	L[c]	L
Tree-shrub shelterbelts managed as wildlife food/cover	M	H	H	L	M
Irrigation tailwater used to maintain habitat	H	H	H	H	M
Irrigation water storage used to maintain habitat	M	M	M	M	M
Feedlot runoff used to maintain habitat	H	L	M	H	M
Cropping restricted to preserve habitat	M	H	H	M	L
Grazing restricted to preserve habitat	H	H	H	H	L
Burning restricted to preserve habitat	M	H	H	M	L

[a] H = High benefits

[b] M = Moderate benefits

[c] L = Little or no benefits

Table 1. (concluded)

Management practices	Population groups				
	Migratory waterfowl	Upland game birds	Upland nongame birds, mammals, reptiles	Shore/wading birds, amphibians, aquatic mammals	Fishes
Public service/industrial practices					
Highway runoff used to maintain habitat	M[b]	H[a]	H	M	M
Sewage effluent used to maintain habitat	H	M	M	H	H
Oil and brine disposal restricted to preserve habitat	H	M	M	H	H
Fish and wildlife practices					
Ground water pumped to maintain habitat	H	H	M	H	H
Soil disturbance to enhance habitat	M	M	M	M	L[c]
Irrigated food and cover plantings	M	H	H	M	L
Shelter piles or structures as cover	L	H	M	L	L
Islands for escape and nesting cover	H	M	M	M	M
Hunting restricted to maintain game	H	M	L	L	L
Stocking to maintain a fishery	L	L	L	M	H

[a] H = High benefits

[b] M = Moderate benefits

[c] L = Little or no benefits

ECONOMIC INCENTIVES FOR HABITAT MANAGEMENT

INCOME FROM HUNTING LEASES

Supplemental Farm Income

Landowners in the Southern Great Plains may look for supplemental sources of income as the financial returns from irrigated croplands are reduced by increased costs of pumping ground water. In the past, many farmers in this region have planted to the very edges of their property and plowed and planted crops in playas. Now, some farmers have found that, when marginal cropland and playas are left undisturbed, wildlife habitat is improved and there is an increase in land value because of income from hunting leases. Some playas may return more from hunting than grazing.

The leasing of unimproved farm land for hunting is not new to Texas. Although the first hunting leases in Texas were mainly for large game, primarily white-tailed deer, waterfowl leases have increased considerably in recent years. Wildlife is considered to be public property in the American tradition, so leased hunting is a legitimate way for a landowner to produce some profit from harvesting wildlife.

Types of Leases

There are several types of hunting leases that a landowner can consider. The first type is the seasonal lease for hunting particular game species, such as deer or waterfowl, in a specified area for an entire hunting season. Daily or weekly leases are also used, especially for big game and waterfowl. In the third type of hunting lease, an outfitter, shooting club, or civic organization secures the hunting rights and then manages the leased area, collecting hunting fees, posting and policing the site, and sometimes making modifications to improve habitat values. In the Texas Panhandle, the Dimmit Kiwanis Club, for example, sells seasonal leases as a fund-raising effort; the use of property belonging to 20 or 30 farmers is donated for this purpose. The American Sportsman's Club is one example of an organization that leases hunting rights from property owners for its members. This type of lease arrangement may be the most suitable for landowners who are reluctant to deal directly with hunters and with the prospect of property damage, littering, and injury liability. This is especially the case with large playa leaseholds that accommodate large numbers of hunters.

The Texas Waterfowlers Association, Inc., a nonprofit organization, is dedicated to increasing and improving wintering waterfowl habitat in the Texas

High Plains playa country for the satisfaction of both hunters and naturalists. The Association seeks to educate landowners on how to manage suitable habitat for overwintering waterfowl, showing them how to transform a liability into an asset. By acquiring wintering habitat under lease, the Association hopes to disperse waterfowl to avoid problems of crop depredation and disease; outbreaks of botulism and fowl cholera would be reduced.

Upland Game Birds

The potential for leased hunting in or around playas exists for upland game birds, such as ring-necked pheasant, scaled or bobwhite quail, and mourning dove, as well as for waterfowl. Pheasants occur in at least portions of most counties in the Texas Panhandle (Figure 5). Irrigated areas of the High Plains, having superior cover vegetation and waste grain food supplies, tend to have the highest populations. Pheasants use crops, such as corn, grain sorghum, and small grains, as food; sunflowers and soybeans are used as alternative foods. Fields of winter wheat often serve as nesting habitat, but many clutches are lost because nesting coincides with the harvest. Pheasants tend to congregate at playas having little open water but extensive natural cover, especially after harvest when the remaining crop stubble is grazed or plowed under and the weedy patches, fence rows, and roadsides have been mowed. As many as 436 pheasants, about equally divided between hens and cocks, have been recorded at a single playa in Castro County, Texas (F. S. Guthery, pers. comm.).

Playa management practices that provide food sources for pheasants, along with year-round cover, can improve the potential for income from hunting fees. The leasing demand for prime pheasant habitat for hunting is increasing, and landowners can share in this new market.

Migratory Waterfowl

Ducks, geese, and cranes are attracted more by open water in playa basins than by vegetation. Geese and cranes prefer a large expanse of shallow open water. Although vegetative cover is important for brooding ducks, apparently it is not as important a habitat component for ducks during hunting season. In general, the larger the area of open water, the greater the number of ducks present. There does seem to be some difference in the use of playas by different species of ducks, depending on the amount of vegetation. Mallard and green-winged teal apparently prefer to roost on playa lakes that are shallow and have some emergent vegetation, such as cattail and bulrush. This type of playa will probably command a higher leasing fee than a bare lake because mallard and teal are sought after by hunters and playas with emergent vegetation are preferred by hunters for the quality of the hunting experience. The lease value of bare playa lakes may be increased if hunting blinds are provided. The presence of a preferred winter food, mainly corn, in the vicinity of a large playa with a persistent water surface could encourage the overwintering of migratory waterfowl. The food source probably should lie within 10 mi of open water (F. S. Guthery, pers. comm.).

Landowners interested in managing playas for leased waterfowl hunting could apply management practices that retain large areas of open water, with

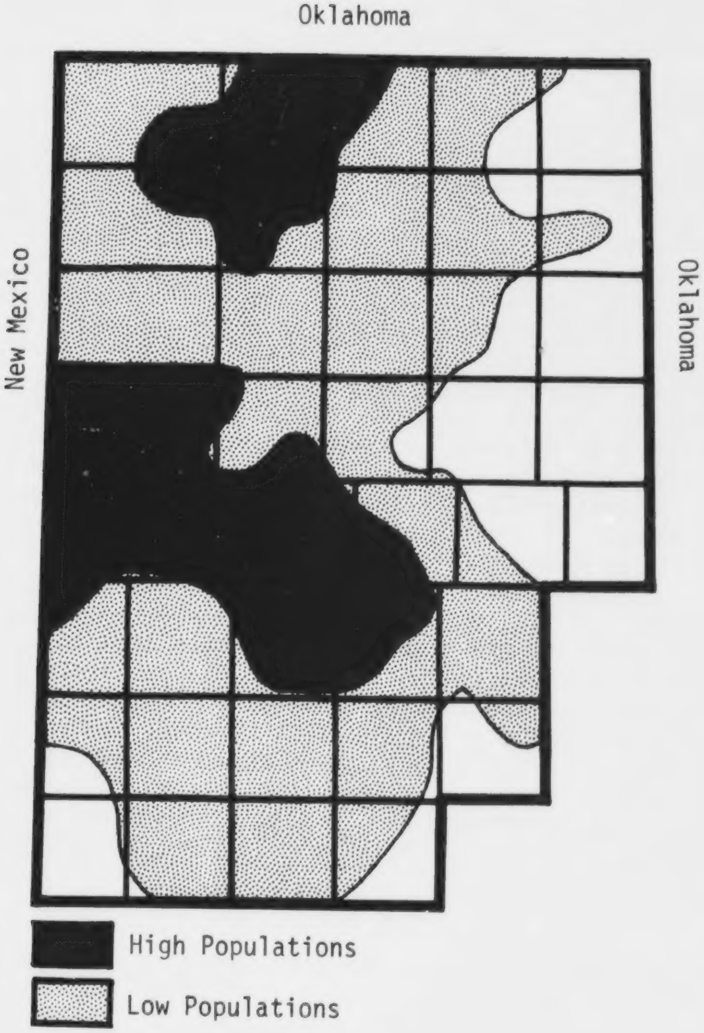
Oklahoma
New Mexico
Oklahoma
▇ High Populations
▨ Low Populations

Figure 5. Pheasant populations in the High Plains of Texas. Densities are highest in the northwestern and southcentral portions of the Panhandle because of the crops grown there, particularly corn, sorghum, and small grains. Grains lost during harvest comprise 70% or more of their diet, and winter wheat serves as nesting habitat. After the harvest of corn, sorghum, and soybeans, the playas provide the prime winter cover. (Map by F. S. Guthery, Department of Range and Wildlife Management, Texas Tech University, Lubbock.)

some emergent vegetation that provides a winter food. Playas in irrigated cropland where open water is more abundant and persistent offer the best management potential (Figure 6).

Leasing Economics

The lease value of a playa basin for waterfowl hunting in the Texas High Plains is probably about $600 per hunter for the whole season, where the basin is maintained with open water and moderate emergent plant growth--cattail and bulrush (J. Steiert, Secretary, Texas Waterfowlers Association, Inc., pers. comm.). The comparable value at a bare open-water playa might be $500 where a blind is furnished, or $400 without a blind. On a daily basis, the Texas Waterfowlers Association, Inc. offered the landowner $15 per hunter under a pilot project during the 1982-1983 season. This project was designed to acquaint landowners with the potential for income from waterfowl hunting on a lease basis. Such a lease could sustain approximately one hunter per 5 to 24 acres, depending on the attractiveness of the site. Daily fees charged for guided hunts may range from $75 to as high as $200 per hunter, including all expenses, such as transportation, lodging, a guide, and decoys. The daily hunter fees for a pheasant lease operation are about half as much as for waterfowl hunting.

For the hunter, the expense of hunting is directly compared to the success rate; that is, the time and effort necessary to obtain game. The success rate for hunters in the Texas High Plains is presently very good, despite the poorly developed hunting economy. In the Panhandle Regulatory District, between 25,000 and 30,000 cock pheasant are harvested each year (Guthery 1979). It takes an average of 2½ hours and six shots to bag a pheasant. In Hart, Texas, it takes about 1 hour and three to four shots to bag a duck. However, hunters may be willing to forego a "sure shot" in order to continue hunting if the site offers a satisfying hunting experience.

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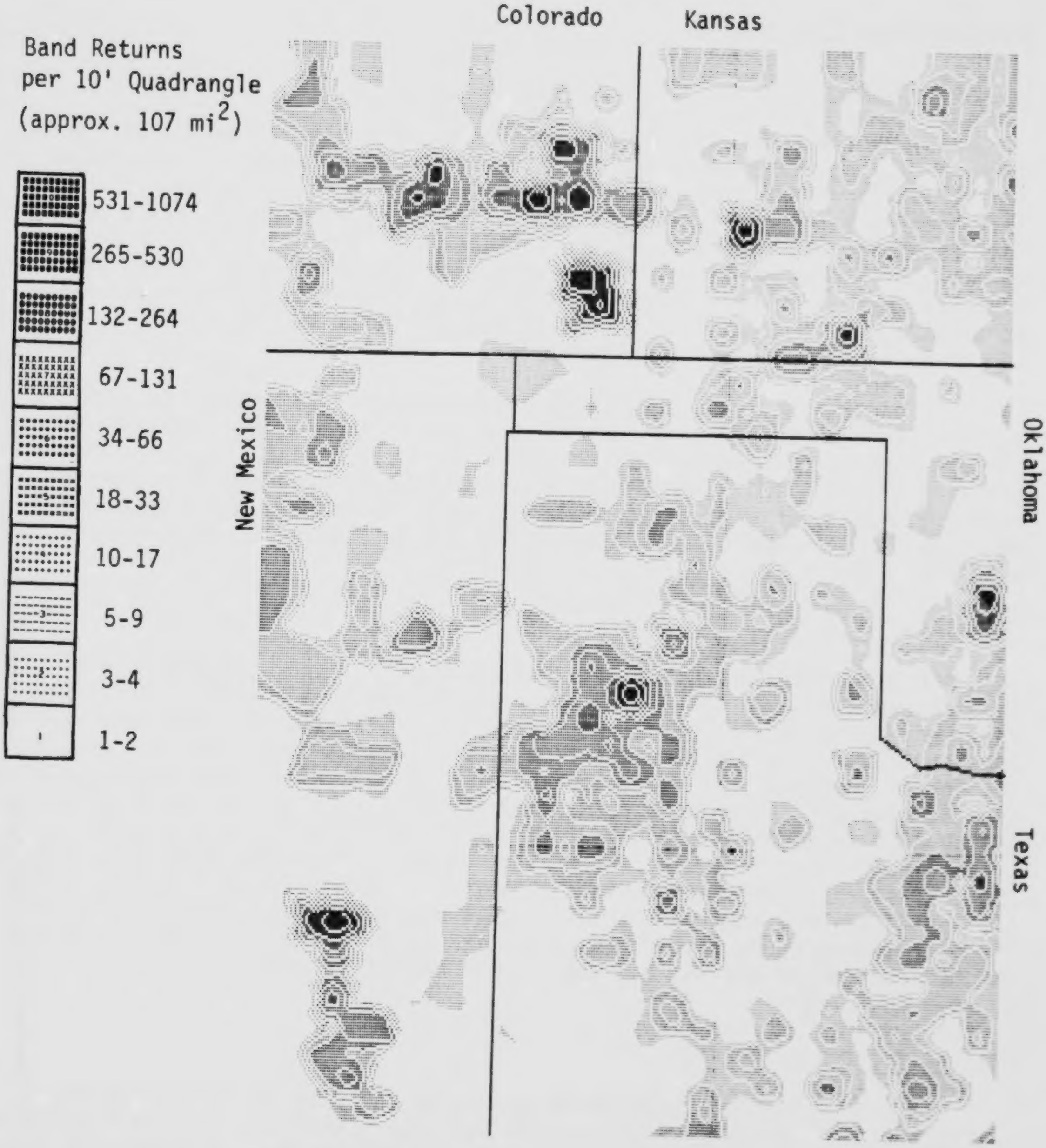
Colorado
Kansas
Band Returns
per 10' Quadrangle
(approx. 107 mi^2)
531-1074
265-530
132-264
67-131
34-66
18-33
10-17
5-9
3-4
1-2
New Mexico
Oklahoma
Texas

Figure 6. Wintering waterfowl density in the Southern Great Plains, based on bird band recovery data from 1934 to 1981. Many of the concentrations shown can be associated with either refuges or lakes and reservoirs, such as Lake McKinney, Kansas; Two Buttes Reservoir, Colorado; Bitter Lake National Wildlife Refuge, New Mexico; and Buffalo Lake National Wildlife Refuge, Texas. Other higher-density waterfowl distributions correspond partly to irrigated croplands where playas retain more open water. (Map by U. S. Bureau of Reclamation, Southwest Region, Amarillo, TX.)

BENEFITS FROM COST-SHARING

Federal Programs

Many of the modifications and conservation practices that benefit wildlife, including playa basin and watershed practices, may be too expensive for individual farmers and ranchers to carry out on their own. Recognition of this problem has led to the creation of several Federal cost-sharing programs that encourage landowners to adopt practices that prevent soil loss and conserve water and wildlife habitat. Two programs available to farmers and ranchers in the Southern Great Plains are the Agricultural Conservation Program (ACP) and the Great Plains Conservation Program (GPCP), sponsored by the U. S. Department of Agriculture.

The effectiveness of the ACP was evaluated in 1978 because of concern among farmers that some soil conservation practices had been short-lived and concern among environmentalists that some agricultural practices had been damaging to wildlife. Since 1978, ACP cost-sharing programs have been improved by making them more available for small farms, have more enduring benefits for soil and water conservation, and have more direct benefits to wildlife.

Funds Available

ACP programs, in keeping with National policy, are tailored to the special needs of each State by Development Groups that have representatives from many agencies, including the Agricultural Stabilization and Conservation Service (ASCS), the Soil Conservation Service (SCS), the Extension Service, the Forest Service, Soil and Water Conservation Districts, and State Conservation Commissions. The funds authorized annually by Congress are distributed by the ASCS to counties through State committees. At the county level, elected committees including farmers and ranchers evaluate individual requests for cost-sharing funds and, using the technical expertise of the SCS, authorize and distribute the funds locally. The maximum Federal share available for each landowner is $3,500 annually; long term contracts (3 to 10 years) can be arranged if the SCS and the Soil and Water Conservation District approve the plan.

Habitat-Related Practices

There are some farm management practices included in the ACP which, although specifically directed at soil and water conservation, are secondarily beneficial to wildlife. For example, two practices aimed at preventing soil loss from wind and water erosion also benefit wildlife: (1) restoration of established windbreaks can supply cover for resident wildlife and provide travel lanes from playas to food sources, such as waste grain in nearby fields; and (2) minimum tillage, along with residue management, can maintain winter cover and food supplies for wildlife gathered at playa basins.

Forestry practices directed at soil and water conservation, such as planting trees and shrubs and improving established stands of trees, can secondarily benefit wildlife by increasing natural food supplies and, especially, cover, which is scarce in the Southern Great Plains.

Direct Habitat Management

Two ACP practices are directed primarily at the conservation of wildlife habitat. The purpose of the first, "Permanent Wildlife Habitat (WL-1)," is to provide upland wildlife cover and natural food sources by establishing or improving stands of permanent vegetation (trees, shrubs, grasses, or legumes); by building permanent fencing to control grazing; and by installing irrigation systems to maintain the vegetation. The Federal cost share for these WL-1 improvements can be as high as 75%, indicating their high priority. The WL-1 practice is suitable on marginal cropland next to playa lakes, or even within basins that normally do not flood. The second wildlife habitat practice, "Shallow-Water Areas for Wildlife (WL-2)," can be used directly to improve playas for wildlife. The cost-sharing funds can be used for earthmoving to construct dams and dikes or levees, allowing water-level management, and to restore the shallow-water area (and possibly to build nesting islands); for food and cover plantings; and for permanent fences to protect against livestock. The Federal share for the WL-2 improvements can be as high as 75%. One condition to funding this practice is that impounded water is not used for irrigation.

Most of the ACP funds used to support conservation practices in the Southern Great Plains, including those resulting in secondary benefits for wildlife, are specified for the prevention of soil loss through water and wind erosion. Only very limited funds have been applied in this region for practices primarily for the conservation of wildlife habitat (Figure 7). The WL-1 and WL-2 practices have never been funded in the Texas Panhandle, but could be authorized if local ACP committees are successfully petitioned by landowners. Farmers and ranchers interested in playa or other wildlife habitat improvement should become aware of the availability of these funds by contacting their local ASCS representatives.

Great Plains Program

The Great Plains Conservation Program (GPCP) is an alternative or additional source of Federal cost-sharing funds available to farmers and ranchers in the Southern Great Plains (Figure 8). The GPCP was authorized by Congress in 1956, in recognition of the special conservation problems in the Great Plains because of frequent drought and excessive wind erosion. The GPCP has 33 approved conservation practices eligible for cost-sharing. Although they are very similar to those covered under the ACP, the GPCP is administered by the SCS, instead of the ASCS.

When a farmer or rancher requests GPCP cost-sharing funds to solve a conservation problem, a comprehensive conservation plan for the property must be submitted; technical assistance in preparing the plan is offered by the SCS. Cost-sharing rates range from 50 to 80%, depending on the regional importance of the proposed practice. Contracts for an accepted conservation plan can cover a period of 3 to 10 years, with the total Federal share as

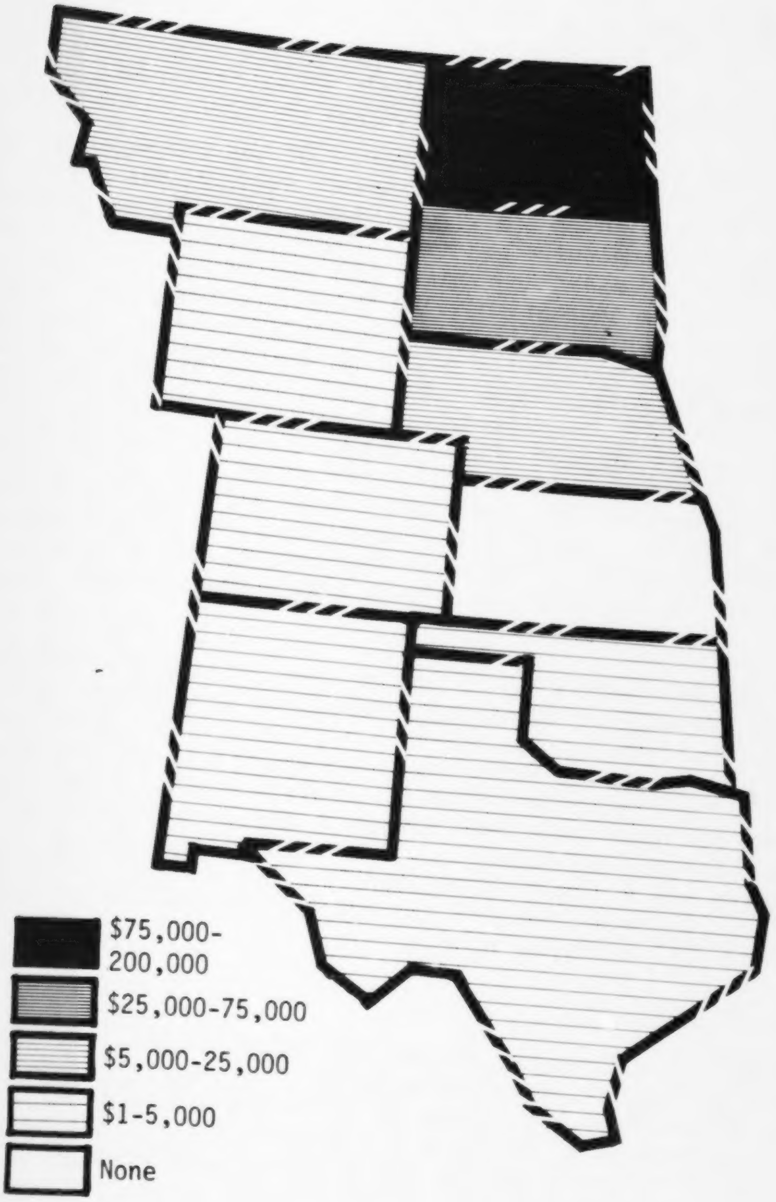
$75,000-
200,000
$25,000-75,000
$5,000-25,000
$1-5,000
None

Figure 7. Cost-sharing funds spent in the 1978 Agricultural Conservation Program (ACP) of the Agricultural Stabilization and Conservation Service (ASCS), U. S. Department of Agriculture, for the conservation of wildlife habitats in the Great Plains States. Funds are available for establishing permanent upland wildlife habitat, as well as shallow water habitat, including playa lakes (U. S. ASCS 1978).

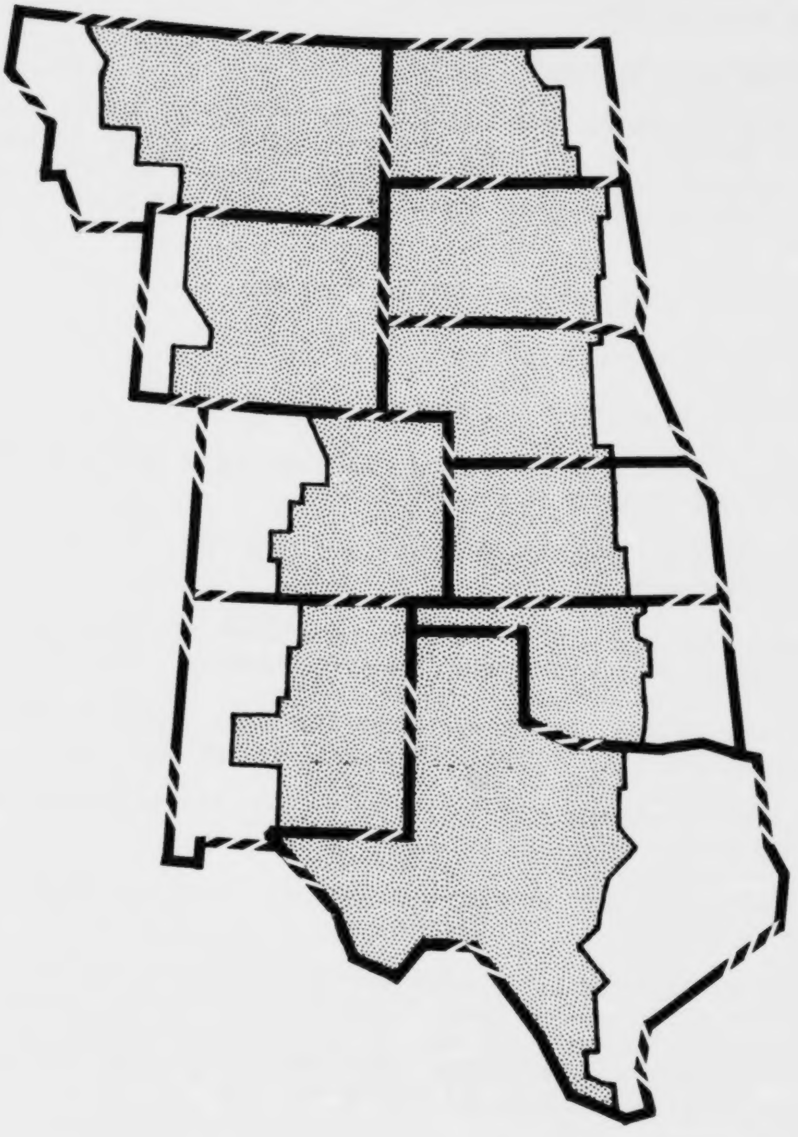

Figure 8. The 519 counties and 10 States eligible to participate in the Great Plains Conservation Program (GPCP) administered by the Soil Conservation Service (SCS), U. S. Department of Agriculture. Cost-sharing funds are available to assist farmers and ranchers in developing shallow-water areas suitable for wintering waterfowl and furbearers, a clear opportunity for playa habitat improvement (U. S. SCS 1982a).

high as $35,000. These funds are available only once to a landowner; annual agreements for a series of different practices, like those covered by the ACP, are not available.

GPCP Management Practices

Several of the conservation practices supported by the GPCP result in secondary benefits to playa wildlife populations because of improved upland habitat adjacent to playa basins. These practices, which increase the habitat carrying capacity by expanding the cover vegetation and natural food supplies, include:

GP-1. Establishing permanent vegetative cover.

GP-5. Reestablishing grassland.

GP-6. Establishing trees and shrubs.

GP-23. Controlling growth of undesirable shrubs to permit growth of desirable cover outside of cropland.

GP-25. Establishing permanent vegetation in critical areas eroding and producing sediment.

Other practices can be directly beneficial to the playa habitat, although wildlife benefits are not specifically mentioned. These include:

GP-21. Constructing, enlarging, or sealing dams, pits, or ponds for water impoundment for purposes other than irrigation.

GP-24. Installing permanent fences to protect against excessive grazing pressure.

GP-28. Recreation land grading and shaping, including establishing protective cover.

Only one GPCP practice is specifically aimed at habitat improvement: "Developing Shallow-Water Areas Suitable for Wintering Waterfowl and Furbearers (GP-31)." This activity has not yet been approved in the Texas Panhandle, but funds with a maximum Federal cost share of 75% are available if a conservation plan is prepared and accepted by the SCS.

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AGRICULTURAL PRACTICES FOR IMPROVING HABITAT

MANAGEMENT OF UPLAND CROPS FOR WILDLIFE FOOD AND COVER

Purpose

Agriculture in the Southern Great Plains makes a valuable contribution towards the food, cover, and water requirements of resident and migratory wildlife. Whether for pleasure or profit, farmers and other land managers may be interested in attracting game birds and other wildlife to their property. Wildlife food and cover in cropland surrounding playas can often be made more attractive by modifying crop and stubble management practices.

Description

Winter wheat sprouts and waste grains, notably corn, supply food for wildlife during the cool and cold months when insects and native seeds and plants are scarce. Pheasants and other birds that nest in croplands obtain Vitamin A from green foliage and other nutrients essential for successful reproduction. Crop losses from sprout destruction tend to be highest where large numbers of birds are concentrated, such as water-filled playas, and may result from a lack of suitable natural food. Farm managers can offset crop losses, to some extent, by planting adjacent to the playa shoreline, but care should be taken to avoid damage to natural food and cover stands of perennial vegetation, such as brush, smartweed, cattail, and bulrush.

Waste corn provides over 90%, by volume, of the winter food consumed in west Texas by four important species of waterfowl: mallard, pintail, American wigeon, and green-winged teal (Bolen and Guthery 1982). Pheasants may obtain as much as 98%, by weight, of their winter diet and 96% of spring diet from waste corn and sorghum. The value of waste grains to wildlife is diminished, however, when stubble is disked shortly after harvest. Grazing the crop stubble may benefit both livestock and wildlife; delayed fall plowing or disking and trampling by cattle make the waste grain more available. Burning of corn stubble maximizes the availability of waste grain for ducks and minimizes their foraging time, but this is probably a poor practice for quail, pheasants, cottontails, and other upland wildlife. Retaining the crop stubble at the soil surface limits soil erosion and helps to preserve soil moisture.

Growing plants, together with the stubble remaining after harvest, provide wildlife with essential shelter from the weather, especially during the winter, and with cover for resting, nesting, and escape from predators (Figure 9). The availability, density, and height of cover in playas and the

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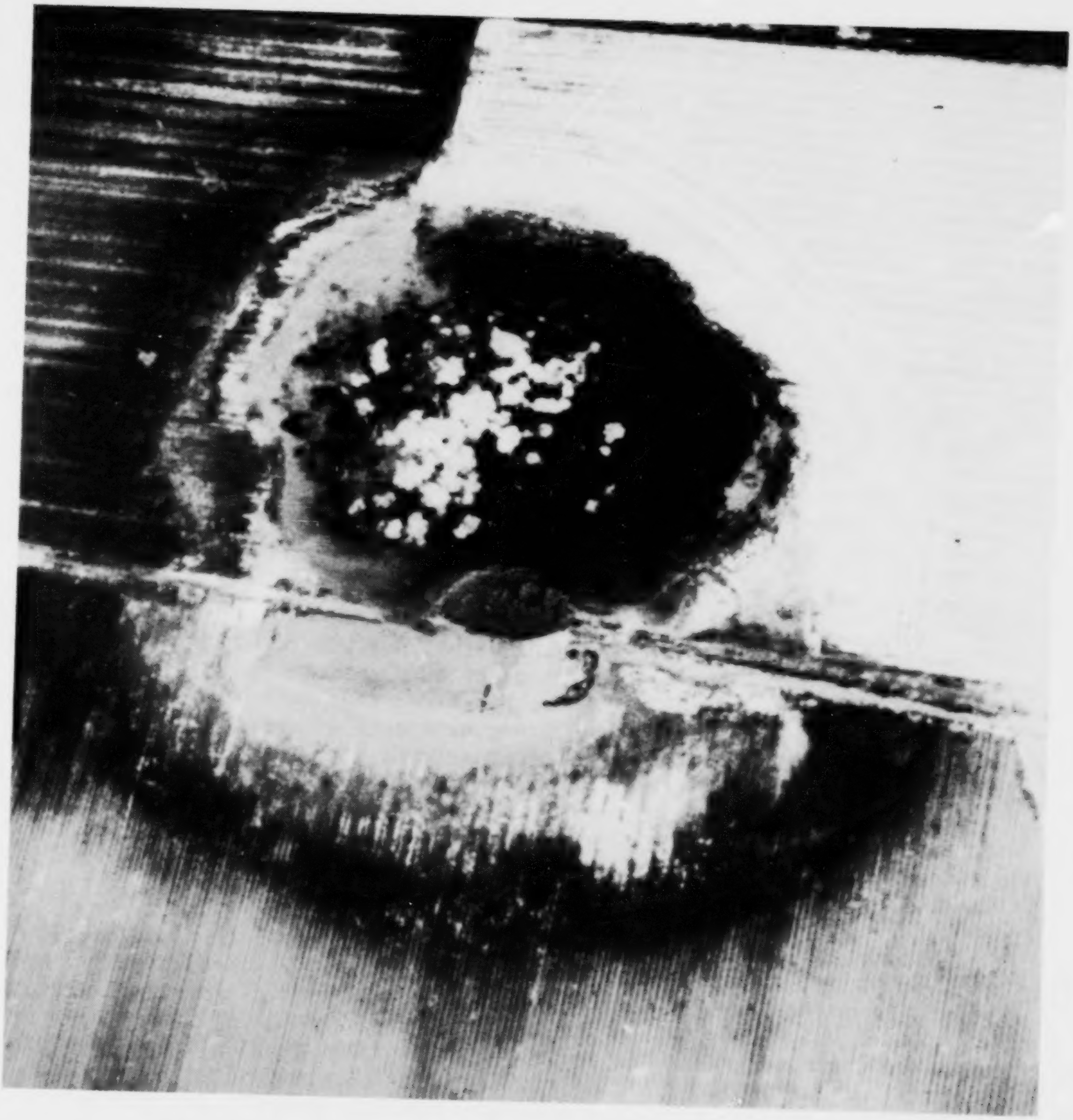

Figure 9. An aerial photograph that shows a variety of crops planted around a playa lake. Harvested winter wheat is on the right, soybeans at the bottom, and irrigated corn at the top and left. Collection and concentration of irrigation tailwater supports perennial wetland vegetation in the interior of the basin, providing habitat for hundreds of ducks and other waterfowl. The variety of natural wildlife cover and crops in the surrounding farmlands increases the habitat carrying capacity for many species of wildlife. (Photo by Texas Tech University, Department of Range and Wildlife Management, Lubbock.)

surrounding fields strongly influence the numbers and diversity of wildlife that will be attracted, overwinter, and successfully reproduce in the area. Playa vegetation, wheat, grain sorghum, soybeans, corn, cotton, and sunflowers produce cover for smaller wildlife, including song birds, doves, quail, pheasants, and raccoons. Some migratory waterfowl--mallard, for example--nest in winter wheat. The larger, more mobile waterfowl, mainly geese and cranes, make less use of moderate to heavy cover. They more frequently glean in open fields following corn and sorghum harvest and rest in areas that lack cover.

Pheasants rely heavily on playa vegetation, wheat, sorghum, and corn; cotton can be a preferred habitat in some months and areas (Figure 10). Wheat and alfalfa are used for nesting cover and summer brooding, while row crops like sunflowers, sorghum, and cotton create travel lanes and cover for resting and loafing. During the fall and winter, wheat is used by ducks and geese; corn, sorghum, and cotton are used by pheasants. Crop stubble becomes very important as wildlife cover when harvesting, tillage, and weed control remove a large portion of the overall available cover. The amount of dried vegetation in playas and ditches, roadsides, and croplands in the fall determines, to quite an extent, the next year's populations of resident game birds and other wildlife.

Land managers can attract wildlife through crop selection and by retaining small, unharvested patches. Planting a variety of crops that attract pheasants around ungrazed, larger playas (over 10 acres) also improves conditions for other game birds because of increased cover diversity. Planting crops that grow and are harvested in different seasons increases standing cover over a longer part of the year.

One approach to pheasant management, based on a unit of land having a one-third-mile radius around an ungrazed playa that is overwintering habitat, calls for planting a 100-acre or large field in winter wheat on one side of the playa and a field of similar size in irrigated corn or grain sorghum on another side (Whiteside and Guthery, in press). Stubble from the summer harvest of wheat and fall harvest of corn and sorghum should be left for food and cover; grazing the stubble is preferred over disking or plowing. Another approach suggests planting 50-acre fields surrounding the playa with wheat, corn, and sorghum, and adding other crops, such as cotton to increase the variety of growing plants adjoining fields with stubble. Small patches of field crops are left unharvested for wildlife during the winter; long, narrow strips receive heavier use than compact patches. Applying this idea to playa wetland management suggests that grain crops may be planted into the smaller basins that do not collect water year-round and would otherwise produce weeds that could spread into cropland. This type of basin planting may reduce weed problems and provide wildlife with food and cover if a portion of the crop if left unharvested. In addition, a long, narrow strip of grain, 6 to 8 feet wide and running in a circle around the playa perimeter, may be left unharvested. A second, similar strip 30 feet out from the first strip will increase the habitat value.

The timing of planting and harvesting is important to avoid game bird nesting losses. Nesting cover should be left undisturbed wherever practical

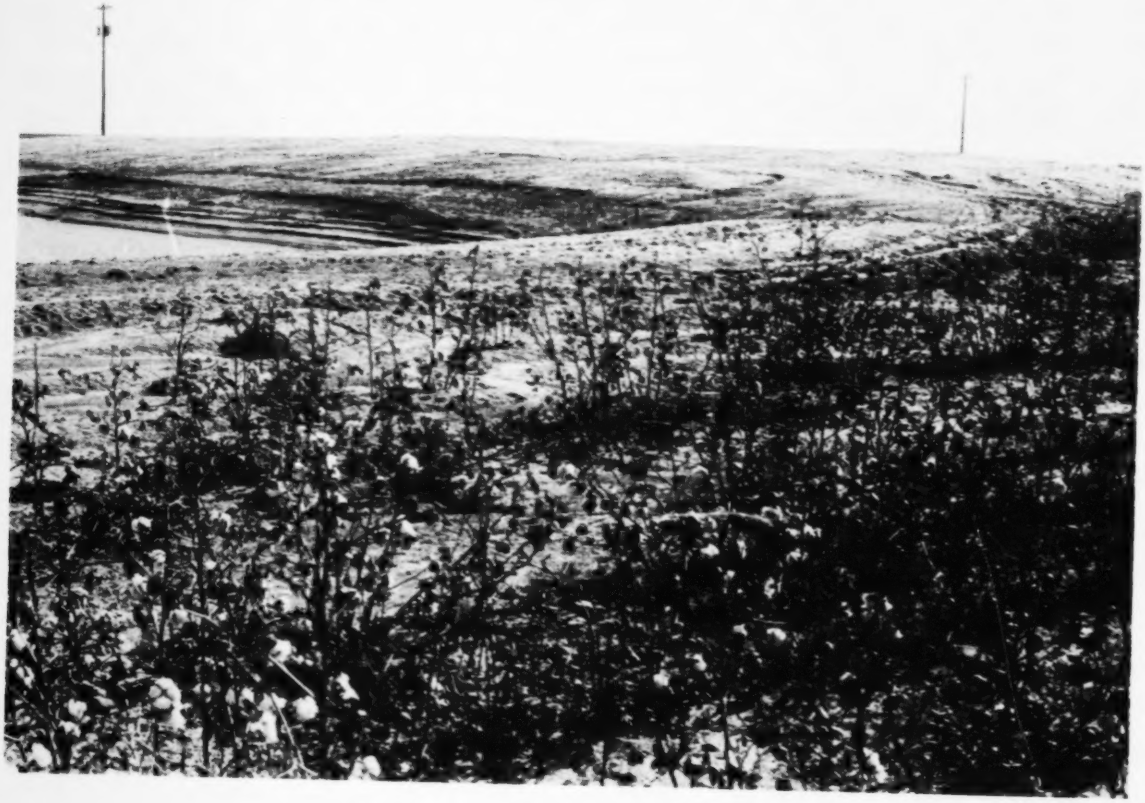

Figure 10. Wildlife cover is provided by cotton near an excavated playa lake. Comparison of bare cropland in the background with cover found in the cotton field shows the value of cotton in providing cover later in the growing season. (Photo by Nelson and Assoc., Inc., Boulder, CO).

by plowing land well before the main nesting period (April-May) and by mowing or harvesting after nesting is over. The first cutting of alfalfa and winter wheat harvest in the lower part of the Southern Great Plains can result in large losses of nests. These operations should be delayed, if practical, until most of the nesting has finished. This would be about late June for most birds. Harvesting by starting from the middle of the field and working outward forces game towards surrounding fallow land or escape cover.

Crop stubble can benefit game birds, especially when long, narrow rows of stubble in separated strips are left through the winter. Stubble heights may be varied, leaving alternating taller and shorter strips, ranging in height between 10 and 20 in. Fields that will lie fallow during the next growing season are best suited to this practice, because stubble is usually disked into the soil well in advance of a new planting.

Limitations

Planting crops and managing stubble in ways that will attract wildlife have few serious limitations. Planting crops on barren playa shorelines and retaining unharvested grain patches will take some extra effort and result in a slightly decreased harvest. Providing crop variety near game-producing playas may require additional planting and harvesting effort and choosing crops having lower net returns. Delaying the harvest of various crops to avoid nesting losses can be costly in some marketing situations; this factor needs to be considered individually for each farm enterprise. Crop weeds and insect pests may increase in some fields where stubble is retained; this problem might be reduced through controlled grazing, or disking might be necessary although it destroys cover value. Highly toxic pesticides, such as parathion applied to winter wheat or azodrin applied to corn, have resulted in mortality among waterfowl, upland birds, and other wildlife. Alternative pesticides less toxic to wildlife and reduced application rates will curb mortality.

Performance

Crop and stubble management to improve habitat and attract wildlife can be expected to increase the abundance of animals where they are already present or usually visit an area. However, animal population dynamics are also influenced by other factors, such as availability of surface water, grit and dusting sites, and mortality due to predators and disease.

Costs

The costs of crop and stubble management for wildlife purposes are very difficult to separate from the cost of overall farming efforts. Farming expense and effort may increase, but added income from hunting leases may help offset these costs. The expense of additional use of machinery to plant crops in strips or cut stubble at varying heights should be considered. The loss of income due to unharvested crops can be estimated using market values for the expected yields minus planting and production costs. For example, with a yield of 30 bushels of wheat per acre in a playa basin, the net return per acre might approximate $55 or $60, and more than twice that for a 60-bushel yield. The value of corn silage or wheat straw can be considered when stubble is left in the field as wildlife cover.

Maintenance

No maintenance is necessary for crop and stubble management practices that benefit wildlife because they are carried out at the time of planting or harvest.

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MANAGEMENT OF UPLAND SHELTERBELTS AS WILDLIFE FOOD AND COVER

Purpose

Shelterbelts that break the flow of prevailing storm winds reduce soil erosion, evaporation of irrigation water, and adverse effects of winds on crops. They also trap drifting snow and increase snowmelt. An upland shelterbelt, primarily a tree windbreak with a shrub understory, also attracts wildlife because it increases the variety of habitat and provides food and cover in croplands otherwise bare of trees and shrubs. Shelterbelts can be planted to increase habitat for pheasants, especially near playas where some winter cover is already available. Wintering waterfowl may also use shelterbelts for protective cover.

Description

New shelterbelts can be planted and existing tree stands improved in terms of their capacity for reducing wind velocity and providing wildlife food and cover (Figure 11). Shelterbelts should be designed to break wind currents from the ground to treetop level through a three-tiered formation of deciduous shrubs such as cherry and Russian olive, conifers like pine and juniper, and deciduous trees such as cottonwood, elm, and ash. A variety of wildlife will benefit if several species of food- and cover-producing shrubs and trees--juneberry and elm, for instance--are planted along the upwind or north edge of a playa.

Prospective sites for shelterbelts should be evaluated to determine the suitability of soil type, nutrients, soil moisture, and the availability of irrigation water. Soil tests can be made and the data analyzed by the local Soil Conservation Service (SCS) office to determine the trees and shrubs that are best suited to the soils (Table 2) and what added nutrients might be required. The Great Plains Conservation Program administered by the SCS may help by cost-sharing the expense of shelterbelt planting.

Table 2. Woody species of vegetation typical to Great Plains shelterbelts.

Tall trees	Intermediate trees	Shrubs
American elm	Boxelder	Caragana
Cottonwood*	Juniper	Cotoneaster*
Green ash	Mondell pine*	Honeysuckle*
Hackberry	Willow	Juneberry*
Siberian elm		Lilac
		Native plum
		Russian olive*
		Sand cherry*
		Skunkbush sumac

*Used by the SCS at a playa demonstration project near Clayton, NM.

Newly planted shelterbelts generally require regular irrigation during the first several years to ensure their survival. Older stands may need occasional irrigation, particularly during a drought. Crop and road runoff can be collected and diverted by ditch or berm to the shelterbelt. In the absence of surface runoff from irrigation return flow or rainfall, supplemental water should be delivered to the shelterbelt at least twice a month to maintain the plantings (Figure 12). Care should be taken to design an irrigation system that will not flood out or wash away the plantings. Trickle or

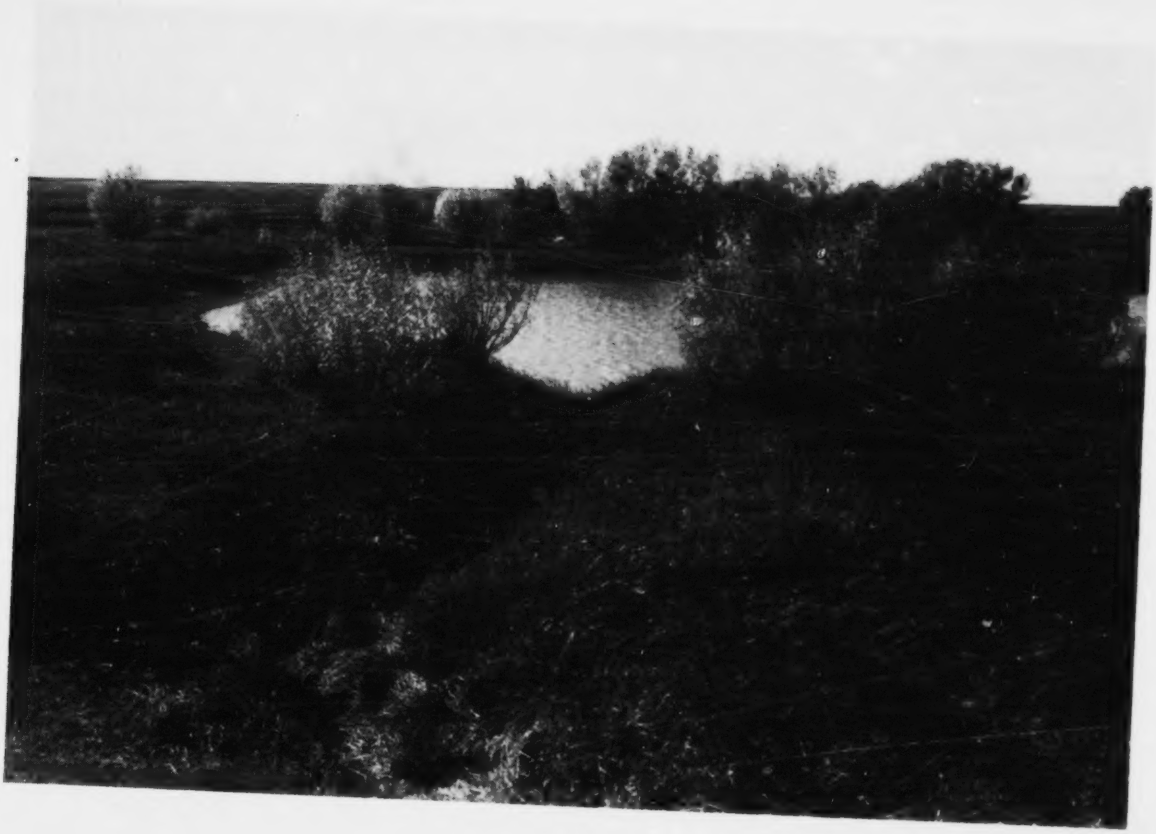

Figure 11. Rangeland playa lakes, bordered by a tree and shrub shelterbelt (background, far shore), provide habitat for mourning doves and heron nesting, while also serving as a windbreak and helping to stabilize the soil. (Photo by Nelson and Assoc., Inc., Boulder, CO)

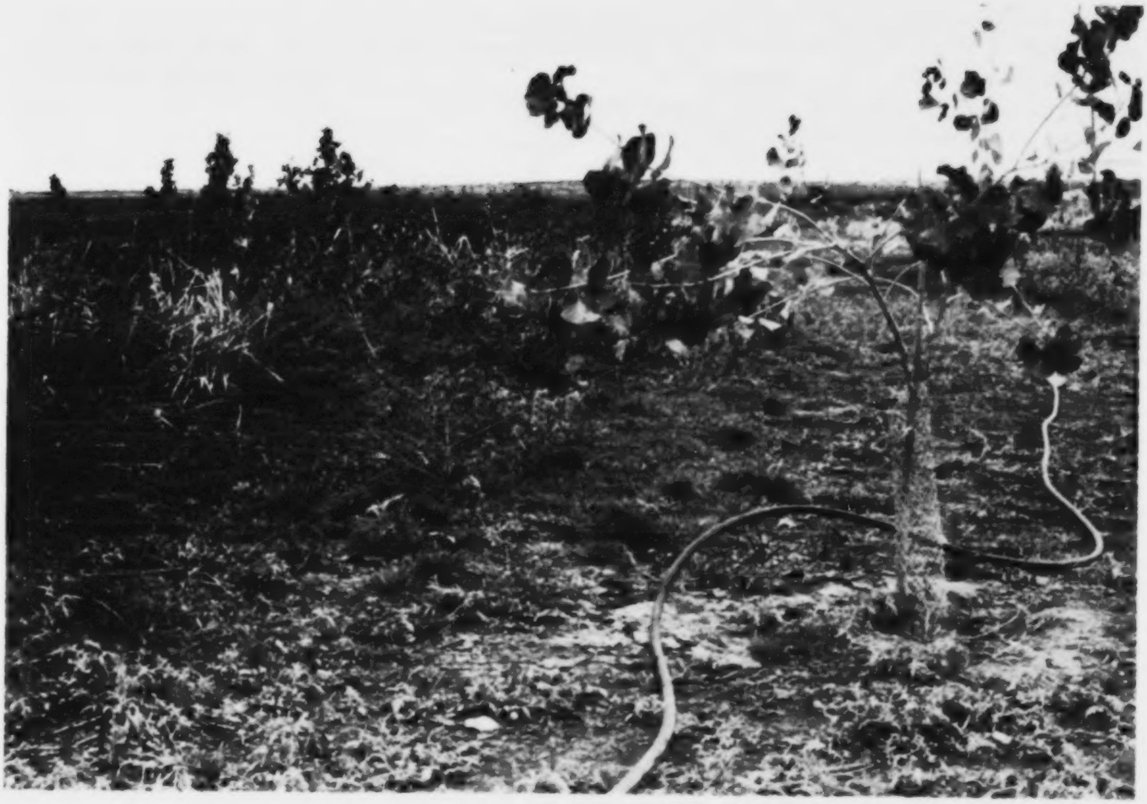

Figure 12. A new shelterbelt planting of cuttings from mature cottonwood trees, forming an arc along the shore of a playa lake in eastern New Mexico, will produce shelter for wildlife. A wire enclosure protects the plants from damage by animals, particularly jackrabbits. An irrigation tube with emitters supplements the water provided by diversion of surface runoff along a parallel berm (on the left). (Photo by Nelson and Assoc., Inc., Boulder, CO)

drip irrigation, which delivers water to plants through individual emitters, may be used but requires pumped storage and filtering to be reliable.

Shelterbelt trees and shrubs are usually planted in rows broadside to prevailing high winds, such as the north and west edges of fields and around the northwest arc of a playa basin. They can be planted as a single three-tiered row or in as many as 12 rows, depending on the need; more rows will break the wind force better. Greater numbers and variety of birds occupy shelterbelts that are over three rows deep. Survival of shrub and tree plantings is uncertain during the first few years of growth; fencing may be needed to protect the young plants from animals. Individual plants within the new shelterbelt should be checked each spring for several years and dead plants should be replaced.

Limitations

There are few limitations to establishing shelterbelts. The amount of land lost to crops, especially at the edge of a playa, may be insignificant compared to the water, soil, and wildlife conservation benefits obtained. The success of shelterbelts in breaking the force of storm winds and attracting wildlife to cover and food depends, to a large extent, on the design and initial upkeep of tree and shrub plantings. "Sapping" can be a problem when lateral tree roots extend into crops and stunt their growth because of competition. Sapping can be minimized by root pruning between the crop and the shelterbelt.

Performance

Shelterbelts are generally considered a successful conservation measure and valuable addition to wildlife habitat. The success of the shelterbelt depends on shrub and tree survival during the initial period of growth. About two-thirds of the shrubs and conifers normally may be expected to survive after the first year, not including accidental or deliberate destruction of shelterbelt plantings. A majority of the early losses usually results from careless use of farm machinery or poorly controlled cattle.

Costs

The expenses of shelterbelt planting are variable, depending mainly on local cost factors. Average costs for establishing a shelterbelt using bare-root tree stock have been estimated by the SCS in Lubbock County, Texas, at under $1.50 per lineal ft; costs would increase substantially using saplings instead (Table 3).

Maintenance

Shelterbelt maintenance is similar in many respects to orchard management. The trees and shrubs may require occasional irrigation and periodic fertilization; control of damage from disease, animals, and the weather may be necessary. Competing vegetation may have to be controlled and unsuccessful trees and shrubs should be replaced.

Table 3. Estimated costs per 100 yards to establish a three-species shelterbelt in the Southern Great Plains (Soil Conservation Service, Lubbock, TX).

Item	Cost
Chinese elm (20 @ $5.00)	$100.00
Russian olive (33 @ $0.75)	24.75
Mondell pine (20 @ $0.55)	11.00
Planting ($1.00/tree)	73.00
Rodent protection ($1.20/tree)	87.60
Wind protection ($0.55/tree)	40.15
Irrigation ($1.11/tree)	81.03
Seedbed preparation	10.00
	$427.53

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USE OF STORM RUNOFF, IRRIGATION TAILWATER, AND FEEDLOT EFFLUENT TO MAINTAIN HABITAT

Purpose

Water that originates from rainfall or snowmelt, crop irrigation, and feedlot drainage can be used to enhance playa habitat values for waterfowl, upland game, and other wildlife. Carefully designed modification of playas by excavating minor pits and trenches and placing spoil in low embankments can preserve open water habitat for longer periods; increase the growth of aquatic and emergent plants; provide loafing sites, nesting cover, and travel lanes; and encourage the growth of shrubs such as saltcedar and willow.

Description

In the semiarid Southern Great Plains there are extensive efforts to control runoff, infiltration, and evaporation losses. Playa basins, modified with trenches, dikes, pits, and pumps, play a central role in collecting storm, irrigation, and feedlot runoff for storage and reuse in irrigation. Besides being cheaper to use than pumping ground water, playa water may be preferred over ground water for irrigation purposes because of its warmer temperature and the presence of soil particles, nutrients, and bacteria. Playa watershed surfaces are contour-plowed, terraced, trenched, and sometimes pitted to increase water infiltration and soil moisture, thereby reducing the collection of open water and the resulting loss by evaporation. These water conservation practices can be adjusted to provide more open water or wetland habitat favored by migratory waterfowl or to produce more upland habitat for game birds and other terrestrial wildlife.

Playa habitat most likely to benefit from trenching and pit excavation is at basins that receive meager amounts of irrigation tailwater or are shallow, have at least 20 surface acres, and lose water rapidly by evaporation. A combined pit and trench design would be useful on any playa that is densely vegetated with cattail and bulrush (Figure 13). The trenches provide open water for waterfowl broods, herons, coots, and other species. A trench holds water for longer periods than the unmodified playa bottom and encourages the growth of smartweed and arrowhead, providing a natural source of food for waterfowl. The spoil banks along the trenches create travel lanes for terrestrial species (and hunters) and increase the diversity of cover vegetation. A peripheral pit is likely to hold water throughout the winter; other portions of the playa will drain and thus provide ideal overwinter cover for pheasant and other species that need such habitat.

Physical modification of playa basins may favor migratory waterfowl because it increases the amount of open water habitat that is available for resting sites in the flyway during dry periods, and some water surface is available even in a drought. However, waterfowl production requires shallow-water wetlands, nesting cover, and natural food, such as emergent plants and aquatic insects, which are often best provided at unmodified playas that receive irrigation tailwater (Figure 14). If playas receive abundant tailwater, minor modification affecting less than 10% of playa basin volume may

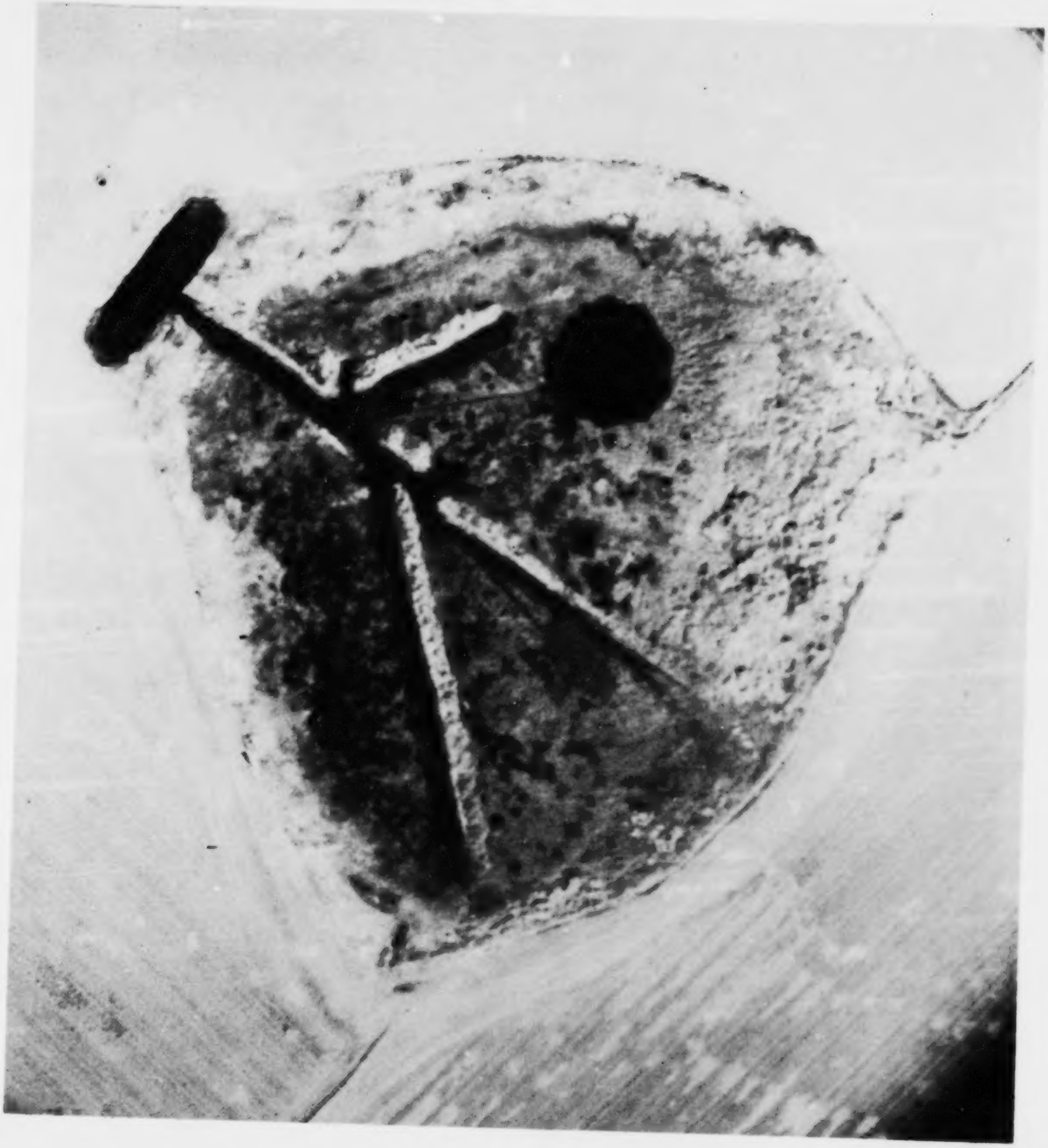

Figure 13. Aerial photograph of a cropland playa modified with a system of trenches used to drain watershed surface runoff into a peripheral storage pit for irrigation of surrounding fields. The concentration of runoff ensures some open water in dry periods when resting sites for migratory waterfowl are scarce. (Photo by Texas Tech University, Department of Range and Wildlife Management, Lubbock.)

Figure 14. Aerial photograph showing dense vegetation produced along channels of irrigation tailwater (bottom of photo) flowing into this unmodified playa, providing diverse wildlife habitat in concentric zones from shortgrasses at the basin edge to wet meadow, emergent plants, and open water at the interior. (Photo by Texas Tech University, Department of Range and Wildlife Management, Lubbock.)

make no difference (F. S. Guthery, Department of Range and Wildlife Management, Texas Tech University, pers. comm.). In fact, playas choked with cattails become marginal brood habitat, so excavating minor open channels may be beneficial.

Diking, trenching, and excavating pits in the playa basin can enhance both water conservation and wildlife management. Dikes pushed up on the playa floor allow control of water levels in sections of the basin; gates in the dikes could be operated to drain one section into another or to release water into a collection trench. Trenching is used to drain the playa surface water into storage pits; sump pumps within the pits deliver irrigation water to nearby croplands. Excavation of deep, steep-walled collection pits on the periphery or in the interior of the playa reduces the surface area exposure, minimizing evaporation. Water in the collection pits attracts livestock and wildlife and can become a valuable source of drinking water, especially during droughts when waterfowl concentrate at playas to rest or loaf. A dike around a storage pond or at least one side of an excavated pit should have a slope no steeper than 3:1 to allow access by livestock and wildlife. This flatter slope also increases shallow-water vegetation and the production of insects and other invertebrates used as food by waterfowl (Figure 15). Pit storage can also be beneficial to wildlife if it is used to prevent or reduce water level fluctuations under conditions that apparently relate to outbreaks of botulism, such as a rapidly receding water level in late summer that exposes mudflats and results in a high concentration of benthic invertebrate carcasses.

Basin diking and trenching make it possible to flood a particular sector to attract waterfowl or drain an area to increase pheasant and other terrestrial wildlife habitat (Figure 16). Placing control gates in dikes or between the collection ditch and trenches could improve water level control in playa basins during flooding or draining. During the fall, most migratory waterfowl are attracted by open water and low-density vegetation. Pheasants and other upland wildlife usually prefer taller, thicker vegetation during the fall and winter for escape and shelter. During the spring, ducks, pheasants, and other ground nesting birds prefer large areas of cover vegetation from 1 to 1.5 ft tall.

If the land manager wants to attract blue-winged teal for the early season, the playa basin should be flooded on the first of September. Water levels may have to be held constant to curtail botulism outbreaks at this time. Flooding on the first of October would be optimum for attracting other species of ducks. Cooler temperatures will reduce, but not eliminate, the danger of botulism outbreaks and they also will diminish evaporation rates. Recent work at Texas Tech University indicates that a playa must be in a relatively secluded area and have at least 20 acres of surface water, preferably more, if attraction of geese is a management goal (Guthery, pers. comm.). Roughly 90% of playa use by geese in the Texas High Plains occurs on the larger lakes.

Management of playas for pheasants, barn owls, cottontails, and other species that require heavy cover in wintering areas calls for a different water regime. The playa should be flooded as often as necessary during summer to maintain saturated soil. However, it should not be flooded more than a

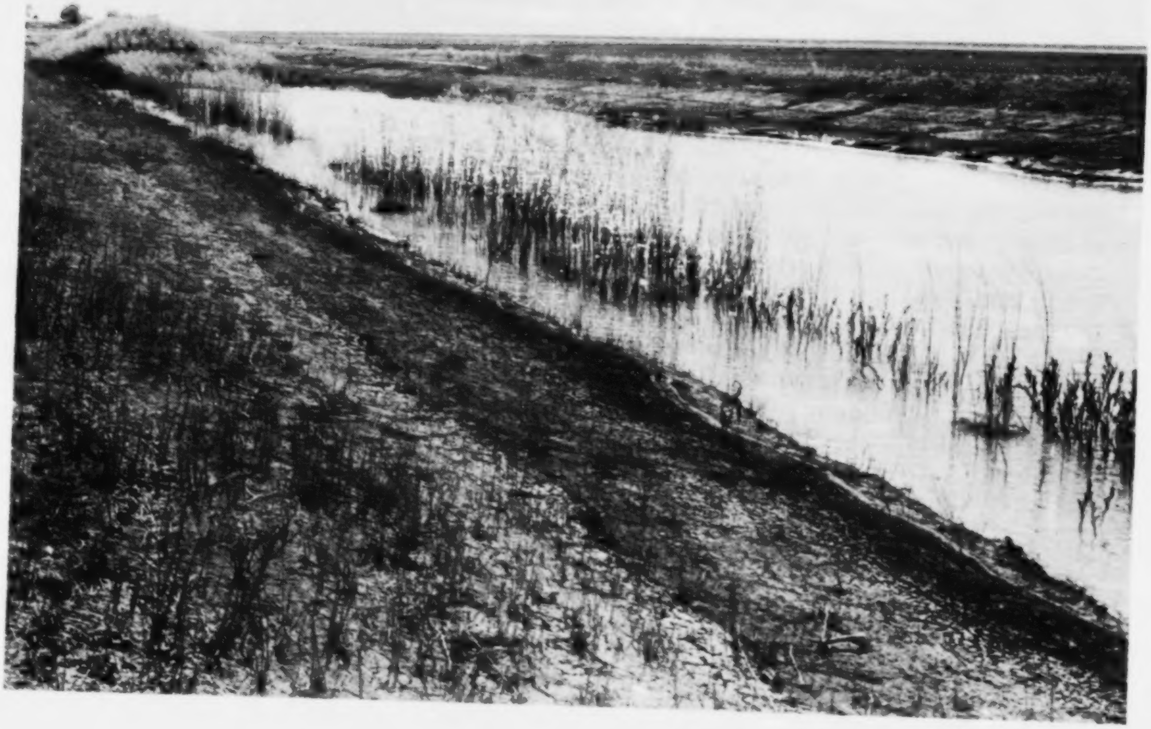

Figure 15. Emergent vegetation in a playa basin modified by excavation and diking to collect irrigation tailwater. Flatter slopes, as shown here, produce more shallow-water habitat for waterfowl, especially for ducks that nest over water, and promote greater production of natural food supplies for waterfowl. (Photo by Nelson and Assoc., Inc., Boulder, CO).

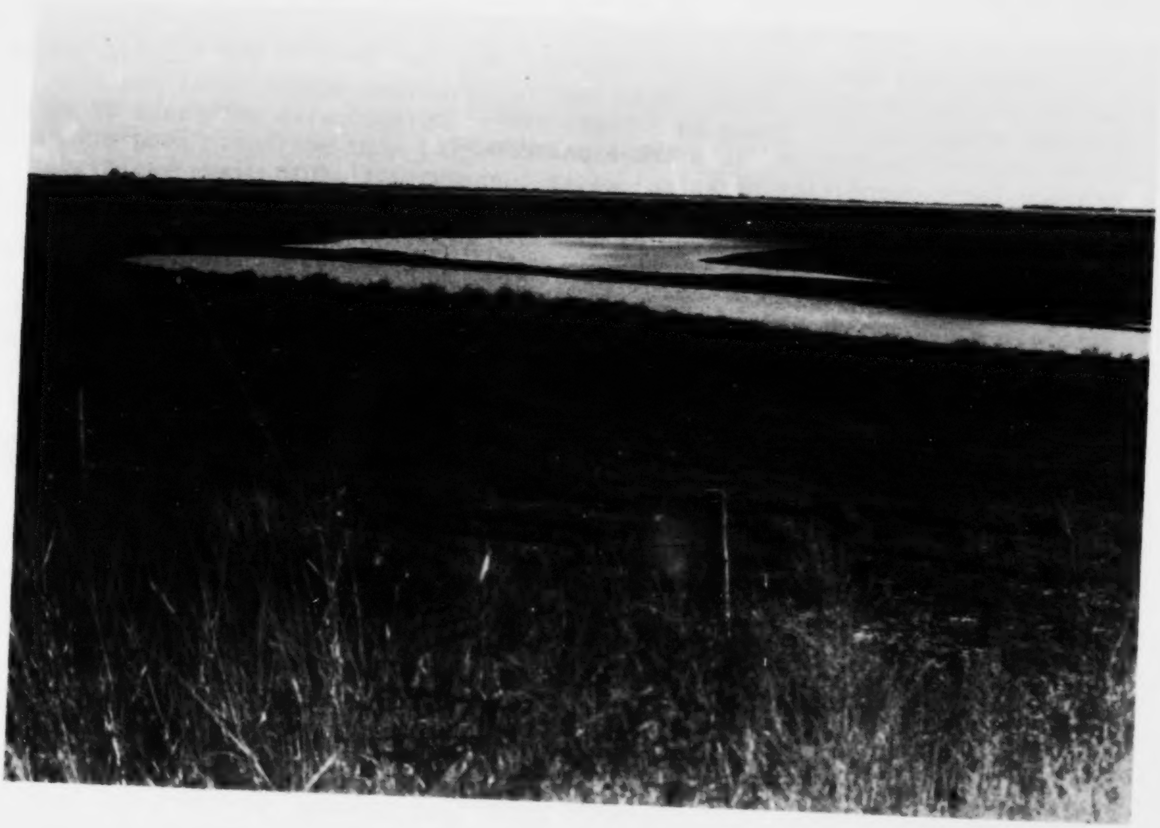

Figure 16. This rangeland playa has been modified with a cross dike in order to concentrate water storage in one sector of the basin during periods of low runoff. Seasonal control of water levels can improve open water habitat for waterfowl and the production of winter cover for upland game birds and other wildlife. (Photo by Nelson and Assoc., Inc., Boulder, CO).

foot deep to prevent mortality to small cattail. Drawdown by evaporation or pumping is useful providing the soil remains saturated with water during the growing season. This regime favors cattail and bulrush, which provide prime overwinter cover. The playa should remain dry during the winter.

Excess nutrients and organic material from fertilizers and feedlot wastes can accumulate in playa lakes, reducing the dissolved oxygen level and biological productivity. These conditions are associated with outbreaks of botulism, especially when mudflats are exposed during warm weather. Feedlots can produce large quantities of animal waste that runs off into playa basins, causing overenrichment with nutrients (Figure 17). The aquatic habitat created by feedlot effluents can be improved by first collecting the waste-laden water in a settling ditch or pond. The ditch or pond should be deep and long enough to slow down the water velocity, allowing organic material to settle. A bypass to the settling pond will allow periodic cleaning. The outflow end of the pond can have a control gate or flash boards to pass discharge water onto a filter strip of alfalfa or grass to further remove excess nutrients and organics before the water flows into the playa basin.

Herbicides and pesticides in irrigation water can be concentrated through the food chain, contributing to toxicity and disease in susceptible wildlife populations. One approach to controlling the concentration of chemicals in playa surface runoff and open water is to limit their rates of application to precise requirements. Integrated pest management (IPM) systems, along with soil amendments (such as humic acid), crop rotation, and minimum tillage may prove as effective in supplying crop nutrients and controlling weeds and insects as chemicals in some cases. However, minimum tillage could prove a liability if it necessitates heavy use of herbicides.

Surface runoff from various sources can be conserved in the soil by improving infiltration, thereby reducing evaporation from pond or lake surfaces. Increased soil moisture supports more vegetation used by livestock and terrestrial wildlife, although waterfowl habitat is reduced. Watersheds of rangeland playas have been modified by soil pitting, bench-leveled terracing, and trenching or furrow cutting to hold moisture in the ground. Pitting involves mechanically digging small, shallow depressions (2 ft^2 by 6 in) over a wide area to hold rainwater where it falls. Bench-leveled terraces are cut along the watershed contour to produce a flat surface across a slope to reduce the runoff velocity and change the direction of overland flow. Trenches or furrows are cut to intercept and distribute runoff around the playa perimeter, preventing direct channeling into the basin (Figure 18). These practices may enhance brush and weed production during the first few years, leading to increased grass density.

In addition to improving water infiltration, a trench or large furrow can be used to divert runoff water into shelterbelt or wildlife food and cover plantings, decreasing irrigation requirements. Water conservation practices, such as these, may be impractical on irrigated cropland if they interfere with established water distribution systems. Contour plowing is more commonly practiced on cropland, usually where slopes are steep enough to prevent ponding and crop immersion. Terraces and trenches should be designed to prevent

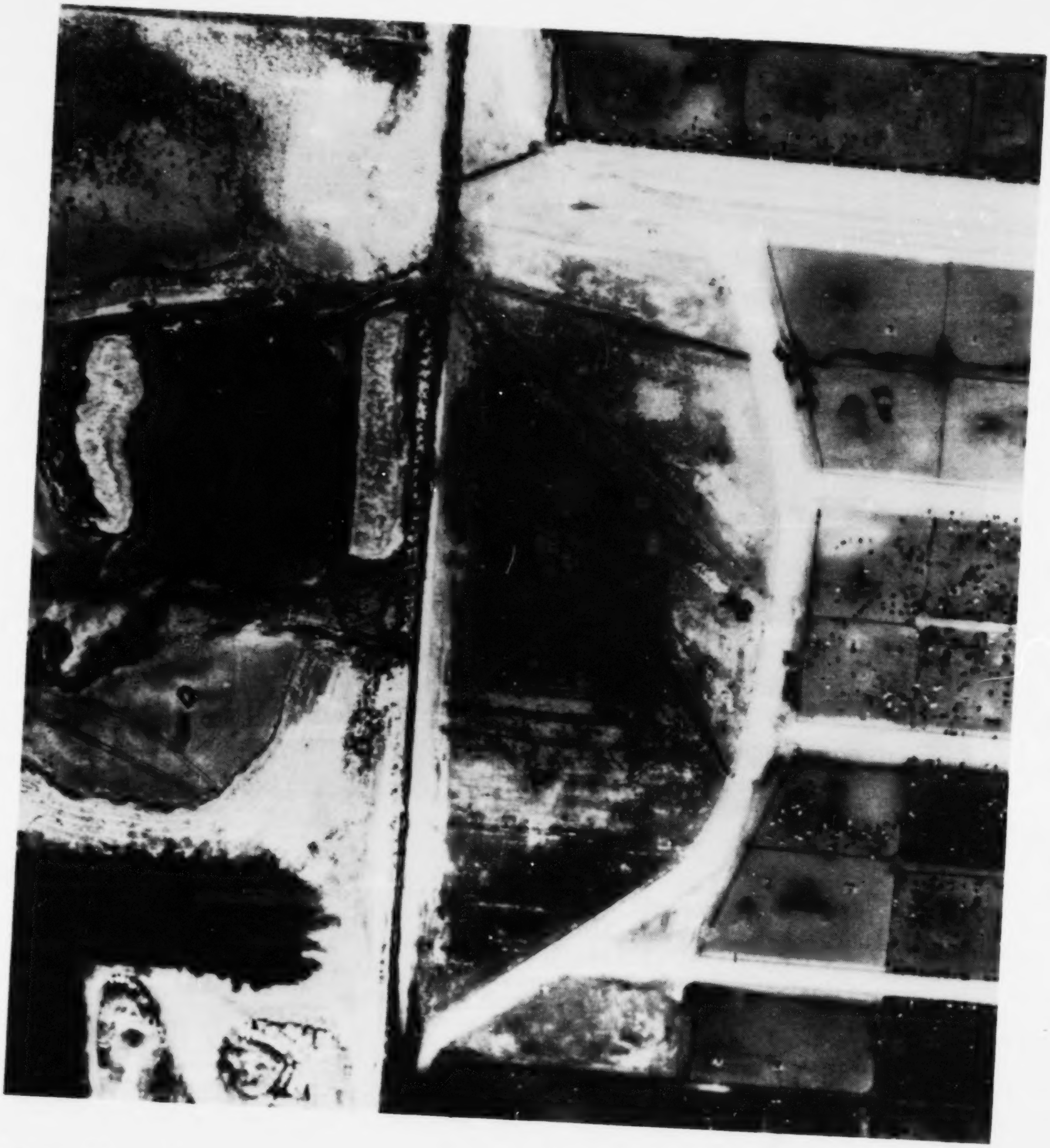

Figure 17. Aerial photograph of cattle feedlots adjacent to a cropland playa that has been ditched and excavated to impound feedlot runoff. The runoff water supports year-round open water habitat valuable to migrant ducks and geese for resting and loafing. (Photo by Texas Tech University, Department of Range and Wildlife Management, Lubbock.)

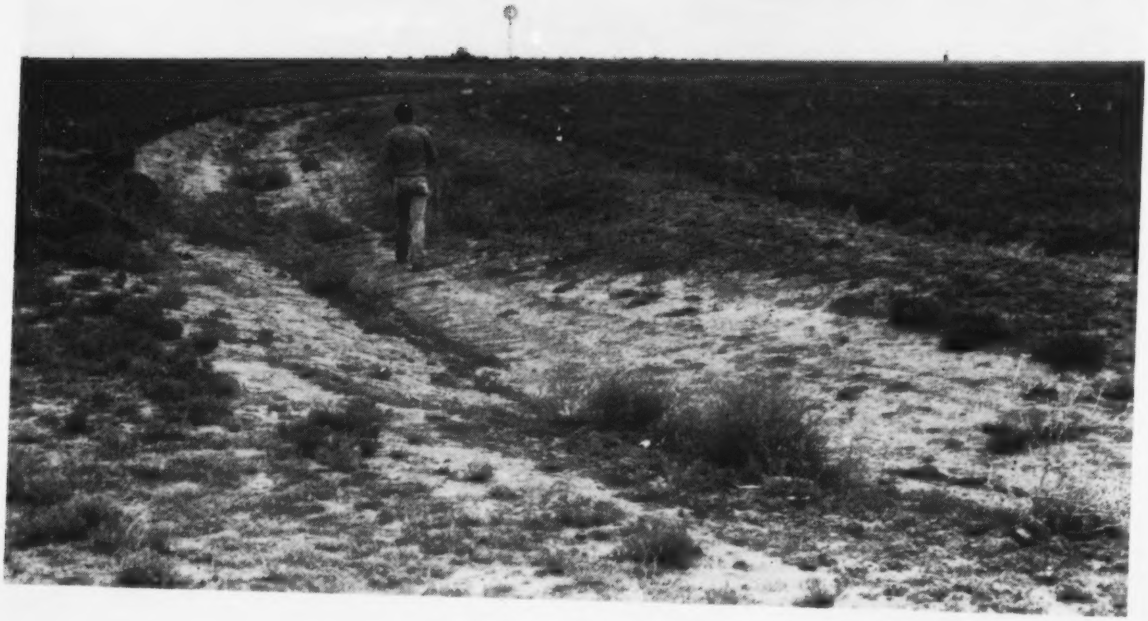

Figure 18. A diversion ditch and berm circling a rangeland playa, designed to retard and distribute heavy storm runoff on the playa watershed in order to increase soil moisture, cattle forage, and wildlife cover. This particular watershed feature also protects downslope wildlife food and cover plantings from washouts. (Photo by Nelson and Assoc., Inc., Boulder, CO).

erosion and washouts. The effects of heavy storm runoff can be countered with reinforced structures, such as rock-filled wire baskets (gabions) or concrete lining where high erosional forces are likely. Overflow channels that direct surplus runoff into the playa basin can be installed if needed.

Limitations

Use of irrigation tailwater and feedlot runoff to maintain aquatic habitat is limited by the concentration of nutrients, which can cause overenrichment and deplete the dissolved oxygen in playa lakes. The silt carried by tailwater reduces the depth of playas. High salinity in feedlot runoff may limit its reuse for irrigation. Playa basin and watershed modifications, including trenches or terraces, drainage diversions, settling ponds, collection pits, sector dikes, and control gates require careful planning and execution to secure effective operation. The variability of runoff into playas makes the design of modifications difficult. Excessive erosion is likely unless adequate berms and spillways are included in water collection systems. Practices designed to retard runoff and retain soil moisture may only be applicable to rangeland or dryland farms if they interfere with irrigation systems or are disrupted by seasonal tilling.

Another concern is that steep-banked pits may create unsuitable habitat for some species of wildlife. Research at Texas Tech University indicates that mallards and green-winged teal will loaf at pits more readily than pintails, gadwalls, or wigeon (Guthery, pers. comm.). Likewise, some shore and wading birds will not use steep-banked pits or trenches. In general, duck use will be greater if the spoil banks are less than 3 ft higher than the water surface.

Performance

Farming practices in the semiarid Southern Great Plains can be used to substantially improve habitat for some wildlife populations. The collection of irrigation tailwater within playa basins improves habitat value by increasing the height, density, variety, and interspersion of natural vegetation. Water conservation efforts, particularly the modification of playas to concentrate surface runoff and reduce evaporation, benefit migratory waterfowl. Any playa modification that increases surface water availability (surface-acre-days) will benefit species that need this habitat, including amphibians and some shore and wading birds, in addition to waterfowl. The spoil banks will be colonized by pioneer plants such as kochia, lambsquarters, and amaranth that add habitat diversity, food, and nesting cover; natural colonization of woody species, particularly willow and saltcedar, often results. Watershed practices that increase soil moisture also increase vegetation valuable as wildlife food and cover, primarily on rangeland.

Costs

According to a recent study, recovery of only 20 to 30 acre-feet of water per year makes playa modifications by pit excavation or sector diking economically feasible (Guthery et al. 1981). Cost savings up to $25 per acre-foot are possible over pumping ground water for irrigation. Only playas over 10 acres can be modified efficiently. The economic feasibility is even greater where a combination of row crops (spring-summer) and small grains (fall-winter) are irrigated using these playa water storage features.

Maintenance

All earthen structures that channel or hold water, such as dikes, terraces, or berms, require periodic maintenance, including revegetation, and occasionally some reconstruction where erosion is severe. Excavations, mainly trenches and pits, may require dredging on occasion to maintain their capacity. In some instances, weed and brush control may be necessary where weed growth in ditches or swales has become too dense to pass flood flows effectively or wildlife cover is too thick for travel. Control gates or flash boards need to be periodically cleared of debris and lubricated or refurbished with new boards.

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RESTRICTION OF CROPPING, WEED CONTROL, AND GRAZING TO PRESERVE HABITAT

Purpose

Playa vegetation often can be managed for wildlife by modifying the usual cropping, weed control, and grazing practices. Game and nongame animals benefit when adequate vegetation remains for escape, resting, and nesting cover and as a natural source of food.

Description

The availability of cover is a critical factor in attracting and holding a variety of wildlife at playa basins. Playa vegetation, whether growing or residual, offers the most valuable overwintering habitat in the agriculturally intensive Southern Great Plains (Figure 19). One factor that greatly

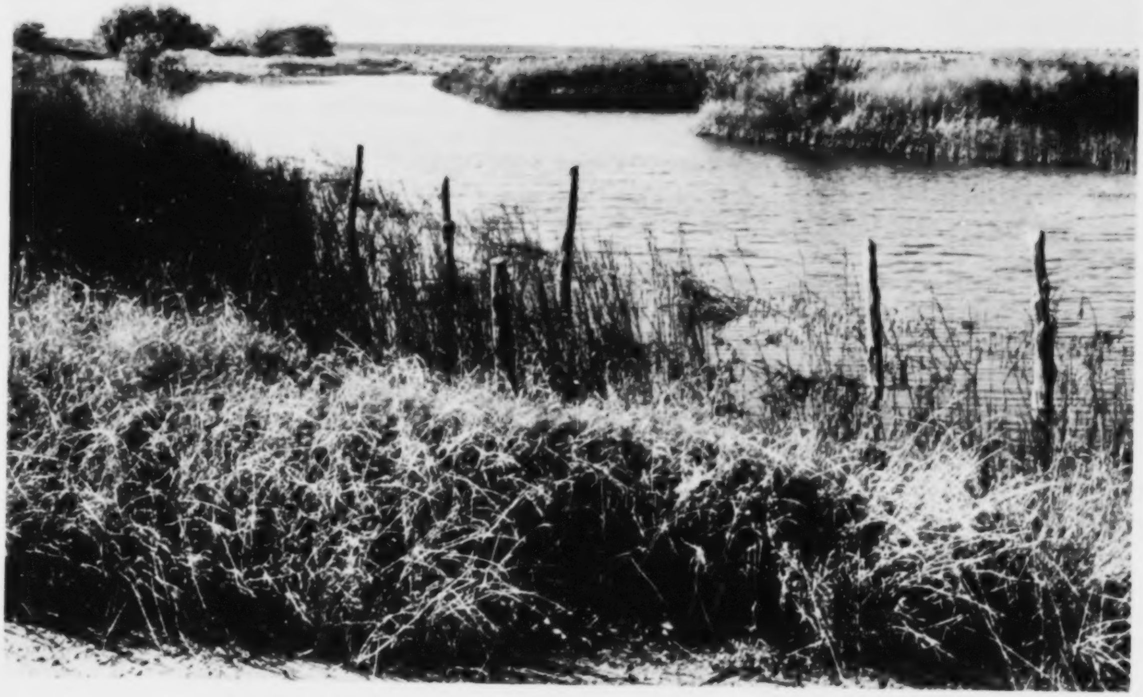

Figure 19. Example of a modified cropland playa lake with good winter and nesting cover for waterfowl and upland game birds, because of standing residual emergent vegetation and shoreline brush. Fencing protects the shoreline from livestock, and the islands provide habitat for safe nesting. (Photo by Nelson and Assoc., Inc., Boulder, CO).

influences the use of playas by nesting ducks is the area of emergent vegetation, such as cattail and bulrush, that is over 1.5 ft tall. Ducks, such as mallards, redheads, and pintails, rely on playas for nesting cover and for some food supplies. Pheasants use cattails, bulrushes, and kochia in playas for roosting, overwintering, and nesting. Teal, doves, songbirds, raccoons, and other wildlife use playa vegetation for their food and cover needs.

A cropland playa, although modified to concentrate irrigation tailwater, can support an abundance of wildlife if it is not planted in crops (Figure 20). Cropping and weed control in playa basins frequently has poor results both for crop production and wildlife. Crops planted in smaller playas fail in as many as four out of five seasons because of flooding (Roolo and Bolen 1969). Even temporary reclamation of such basins often is economically impractical. Basin plowing for weed control may increase weed production and result in establishing undesirable weeds in crops. Cultivating crops in playas and plowing and burning for weed control usually are ineffective and uneconomical farming practices. They also can reduce the wildlife carrying capacity by eliminating shelter, nesting sites, and food-producing vegetation.

Wetland burning from fall through spring generally destroys winter cover and nesting habitat of ducks, pheasants, and other wildlife. However, controlled burning in the midsummer of alternate years can be useful in opening up wildlife travel lanes in very dense, impassable cover. A cover burn of cattails with about 1 to 3 inches of water in the playa may be useful at times to reduce accumulated biomass and rejuvenate the vegetation. Burns for habitat management should not be made in late summer when soil moisture is low or when the roots of cattails or bulrushes are exposed.

Grazing is playa basins can reduce or eliminate taller wildlife cover, depending on how, when, and to what degree grazing is allowed. Common use grazing, where several kinds of livestock are pastured together and stocking rates are high, may eliminate more wildlife cover than single use grazing because a greater diversity of vegetation is consumed. Year-round grazing can be very damaging to habitat for many birds, and continuous spring-summer grazing may interfere with nesting of some nongame birds. In the Southern Great Plains, cropland playas are usually grazed intensively during the cool season in the fall, eliminating winter wildlife cover, while rangeland playas are grazed year-round.

Some grazing in playa basins, if properly managed, can improve both hunting and habitat quality (Figure 21). A key to protecting habitat is preventing livestock from trampling lakeshore vegetation and causing bank erosion. Fencing can be placed so that cattle have access to water, but their movements are restricted to a narrow sector of the playa. Spoil banks and dikes can be lightly grazed to make playas more attractive to migratory waterfowl, also increasing hunter use. Moderate grazing of dense playa vegetation can improve breeding habitat for several birds, such as plovers and meadowlarks. On the other hand, restriction of grazing may be necessary for successful waterfowl and pheasant nesting. Removing all grazing from playa basins large than 10 acres is recommneded if the management goal is to promote pheasant and other game habitat. However, removal of all grazing may only be feasible on cropland playas.

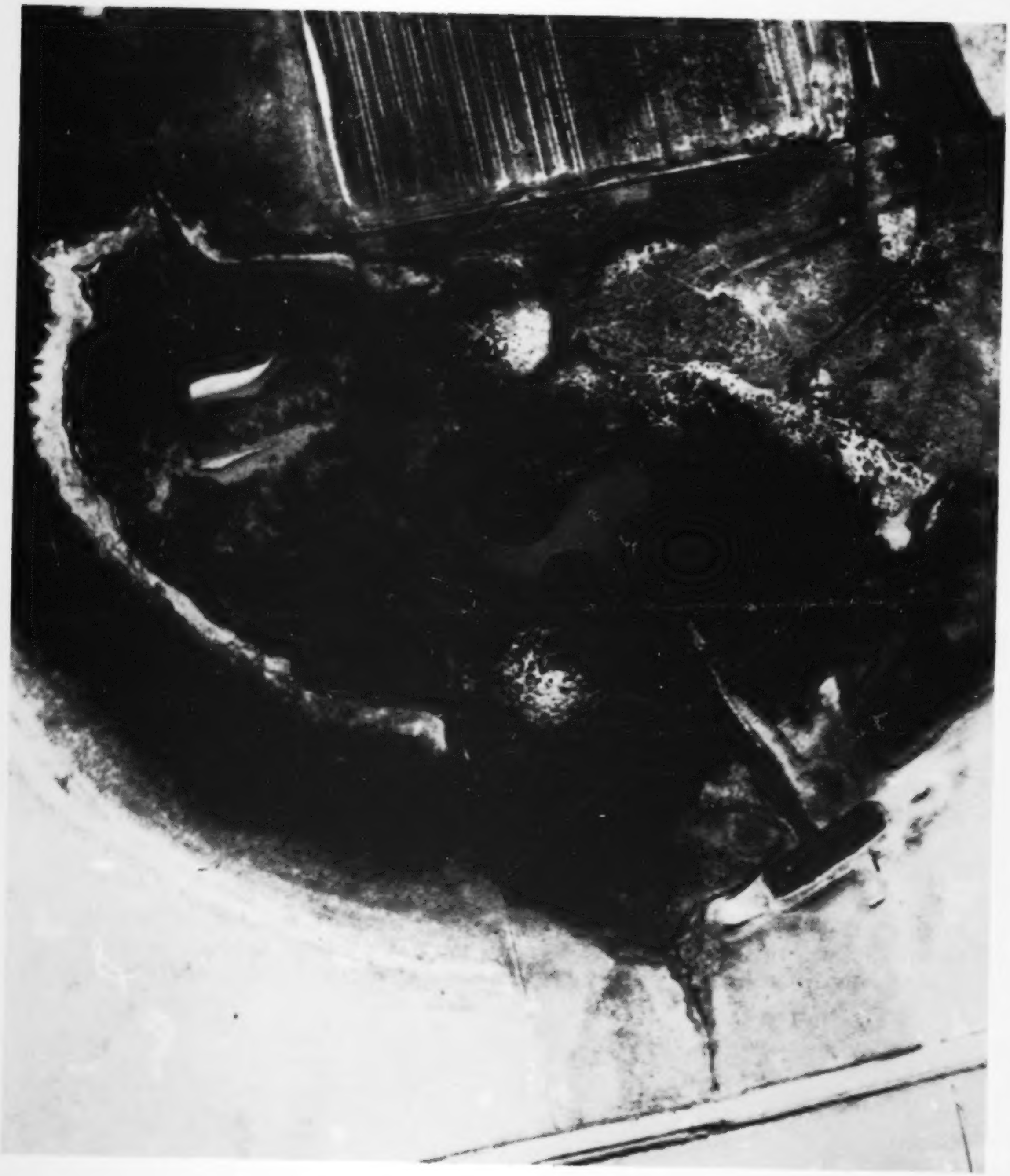

Figure 20. Aerial photograph of a modified cropland playa with only limited displacement of natural wildlife cover by a field of cotton. This playa receives irrigation tailwater from surrounding croplands, resulting in greater habitat diversity and carrying capacity. (Photo by Texas Tech University, Department of Range and Wildlife Management, Lubbock.)

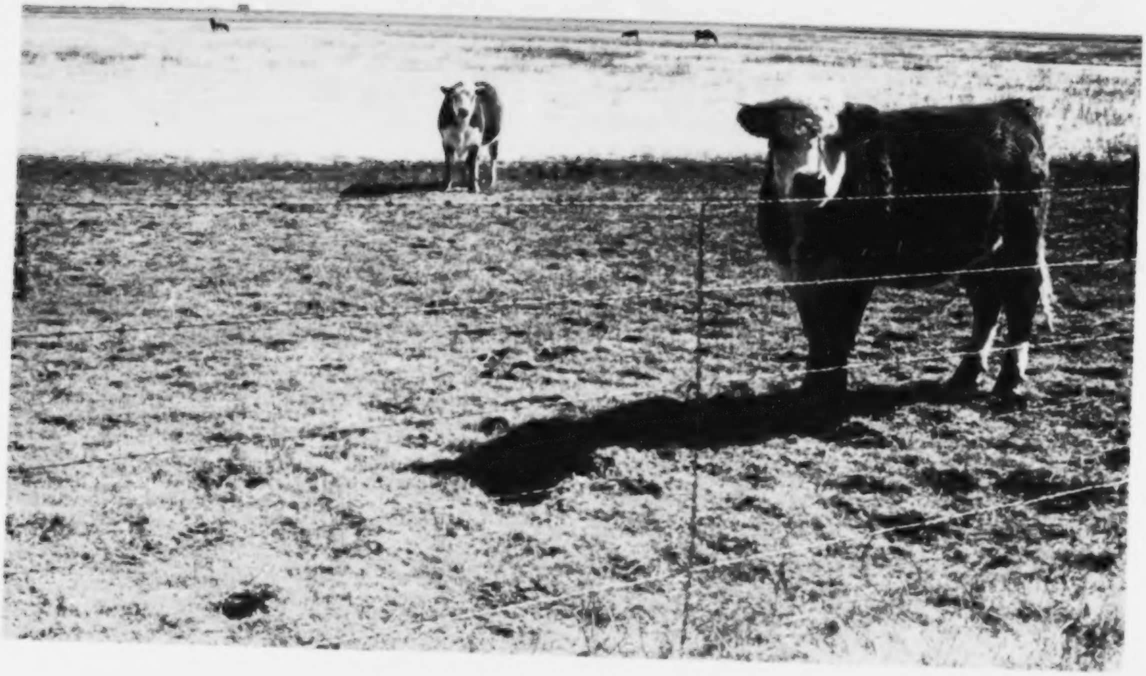

Figure 21. Fencing and controlled grazing by cattle and horses help to preserve wetland vegetation and waterfowl habitat at this typical Texas High Plains rangeland playa. (Photo by Nelson and Assoc., Inc., Boulder, CO).

Grazing on rangeland playas can be managed using a system of pasture rotation, so that some residual cover is left for winter shelter and nesting (Figure 22). Rest-rotation grazing of pastures usually results in better waterfowl habitat than continuous grazing, especially when residual nesting cover is left standing in a strip pattern. Grazing that is heavy enough to reduce vegetation below 10 inches tall limits nesting success. Maximum benefits for overwintering and nesting birds occur when a pasture is rested from late summer to late spring. Grazing of rested pastures should not occur until after the peak of waterfowl or pheasant nesting in late June to avoid nest losses. All grazing should end by late summer so that adequate cover is left for winter and the next nesting period. Wildlife habitat value can be increased by rest-rotation of pastures, if grazing is deferred until after the key food-producing plants, such as amaranth and lambsquarters, set seed by midsummer.

Pasture fencing is required in rest-rotation grazing, but perimeter fence construction may only be practical for small, isolated playas. Larger basins can be partially fenced to exclude a major portion of the area from grazing. Fences can be constructed that do not hinder the passage of wildlife (Figure 23). Barbed wire fences should have a smooth bottom strand at least 16 inches up from the ground for pronghorn antelope passage; the top wire should be no more than 40 inches high for deer crossing. The use of poles in place of the top wire reduces game losses and damage to range fences.

Limitations

Restricting farming, weed control, and grazing of playas in order to promote wildlife has some economic limitations, but may offer some compensation to the landowner. Loss of revenue from not planting crops where playas usually do not flood, or from reduced grazing, may be offset by hunting lease income. Crop weeds often spread where the soil is heavily disturbed, and playa weed dispersal will decline with minimum tillage. A variety of wildlife is attracted to protected playas, which can result in greater damage to adjacent cropland. These losses may be offset by planting or protecting wildlife food-and cover-producing plants within the basin and then selling hunting leases. Another possible compensation for discontinuing planting crops in playas is designating the playa basin as set-aside land under the acreage restrictions of a government price support program. One overriding consideration is that many playas that do not ordinarily flood and are feasible to plant in crops are also under 10 acres and may be too small for effective wildlife management.

Performance

Providing vegetation for food and cover in playa basins attracts and supports a variety of wildlife and improves nesting success for birds. Managed grazing and the elimination of basin cropping and strict weed control improve wildlife habitat because of the persistence of a greater amount and diversity of food and cover plants.

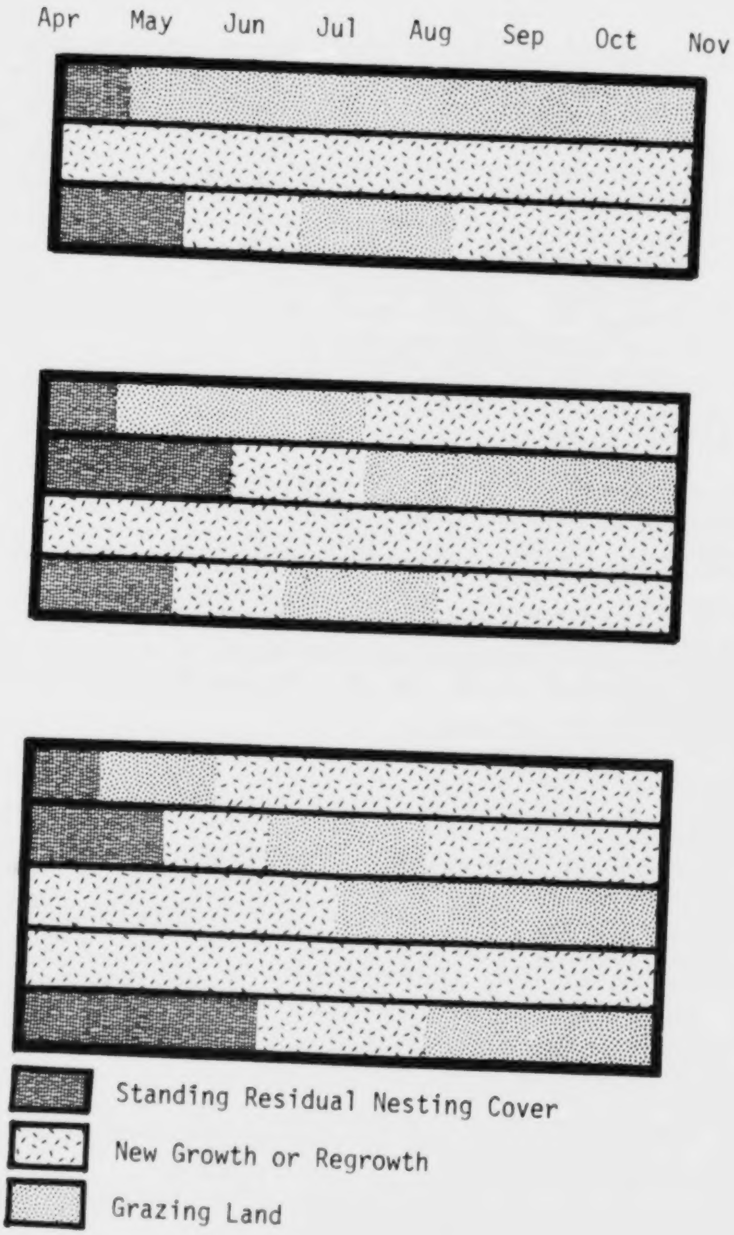

Figure 22. Three-, four-, and five-pasture rest-rotation plans for managed grazing from April through November. The best habitat for waterfowl, pheasant, and other wildlife occurs where there is maximum standing residual cover from winter through late spring. (Adapted from Eng, Jones, and Gjersing 1979.)

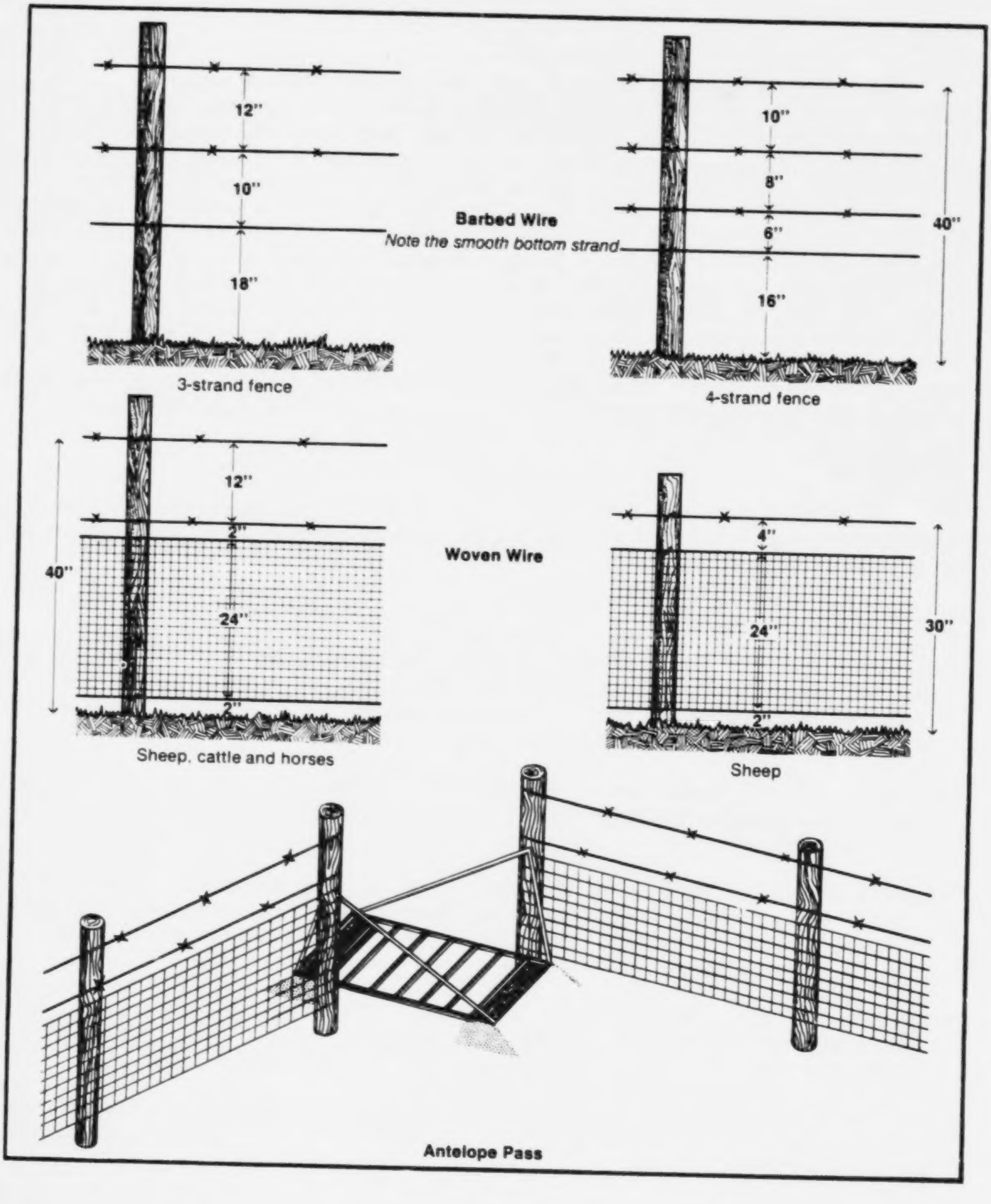
12"
10"
18"
3-strand fence
Barbed Wire
Note the smooth bottom strand
10"
8"
6"
16"
40"
4-strand fence
12"
2"
24"
2"
40"
Sheep, cattle and horses
Woven Wire
4"
24"
2"
30"
Sheep
Antelope Pass

Figure 23. Livestock fences designed to be passable for antelope and deer and an antelope pass that uses a cattle guard. (Adapted from Nelson, Horak, and Olson 1978.)

Costs

Restrained cropping, weed control, and grazing reduce expenses, although farm or ranch income may decline somewhat unless lost revenue is offset by income from hunting leases. Minimum tillage decreases energy and equipment maintenance expenses because there is less equipment use; labor expenses are also reduced. The loss in net income from crops not planted in playas--approximately $75 per acre per year for winter wheat, for example--is partially offset because crop losses due to flooding are avoided, which occurs about one year out of three, on the average. Removal of grazing from playas results in loss of grazing lease income, which may range from $3 to $10 per acre per year. The cost of new fencing should be considered when calculating possible losses of income from grazing; 3-wire, 4-wire, and net wire fencing may range in cost from $0.75 to $1.25 per ft, on the average (Guthery, pers. comm.). Many moderate- to large-sized playas (over 10 acres) can be removed from both cropping and grazing and still return a fair profit from hunting leases.

Maintenance

The main maintenance with restricted playa use concerns fencing. Fences need to be checked periodically to repair damage by livestock and replace worn or weathered segments.

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PUBLIC SERVICE OR INDUSTRIAL PRACTICES FOR IMPROVING HABITAT

USE OF HIGHWAY STORM RUNOFF TO MAINTAIN HABITAT

Purpose

Aquatic and terrestrial habitats can be improved, soil erosion decreased, and crop losses from flooding diminished when highway right-of-way storm runoff is diverted into playa basins.

Description

Runoff from highway corridors in the Southern Great Plains has traditionally been channeled into playa basins in order to drain roadside ditches. In some cases, diverted storm flows have caused severe erosion in adjoining croplands and loss of crops by flooding at the playa interior. Diversions can be designed that will reduce erosion, avoid flooding of croplands, and enhance wildlife habitat at the same time. Runoff collection and diversion structures that reduce water velocity while channeling the flood flows are necessary. Storm runoff can be diverted into the playa watershed to increase soil moisture or channeled directly into the basin interior to accumulate for irrigation pump-out (Figure 24).

Collection of road runoff at a point high on the watershed above the playa floor will increase soil infiltration; the diversion course for pooling the runoff in the basin is usually the shortest route from the road. An alternative design that meets both objectives may use the highest practical point on the watershed where runoff can enter. At this point, a concrete apron can be built to divert runoff water into a collection box, where it can be directed into a ditch leading to the center of the playa or diverted into a large trench or furrow, or a series of parallel furrows, that run around the playa perimeter on a gradual slope. The concrete collection box should be easily cleaned of sediment and brush and able to pass extremely high flows directly into the playa basin to prevent a washout of the trench or furrow system. Flash boards can be adjusted at either the watershed or direct discharge side of the collection box to control the flow direction and volume. The direct ditch into the playa should be stabilized with sod, wire-covered rock (gabions), or concrete, where necessary to prevent erosion (Figure 25). Water velocity can be checked by placing log or wire and rock check dams at intervals along the ditch or perimeter trench, depending on the slope.

Highway runoff, managed for wildlife, can be diverted to support vegetation for cover and food in the playa watershed, increase open water in the

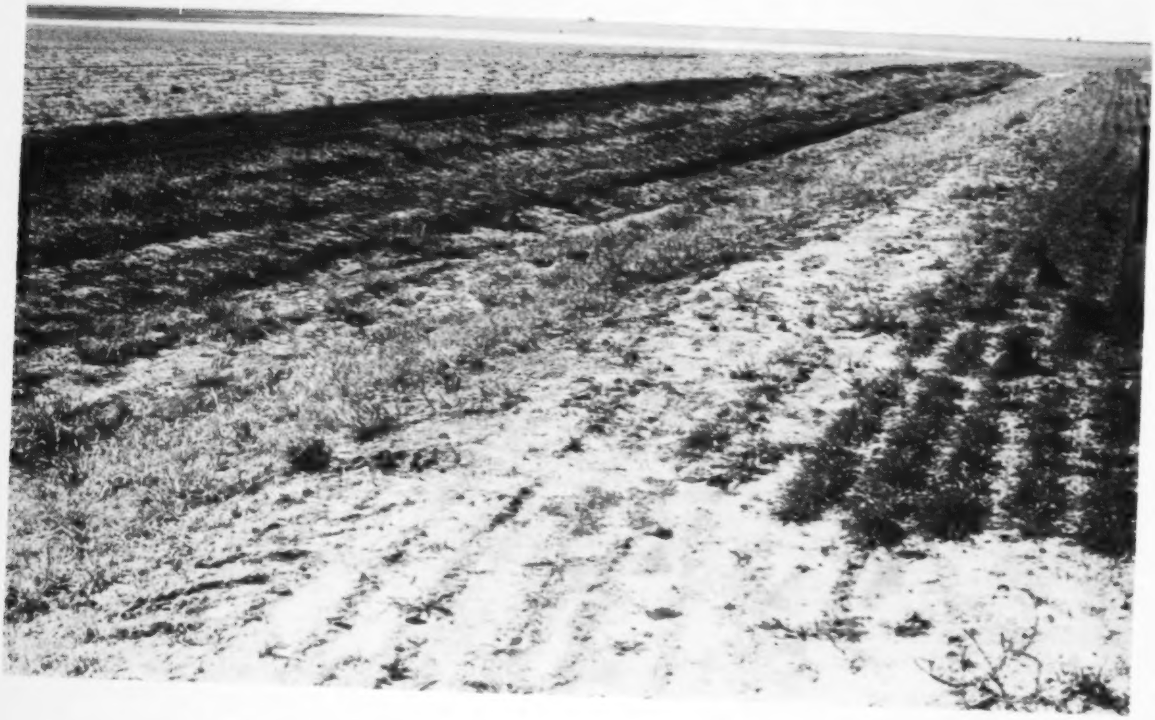

Figure 24. A grass-lined trench and berm designed to divert highway surface runoff into a playa lake (top of photo) to supplement the irrigation water supply and expand open water habitat for waterfowl. (Photo by Nelson and Assoc., Inc., Boulder, CO).

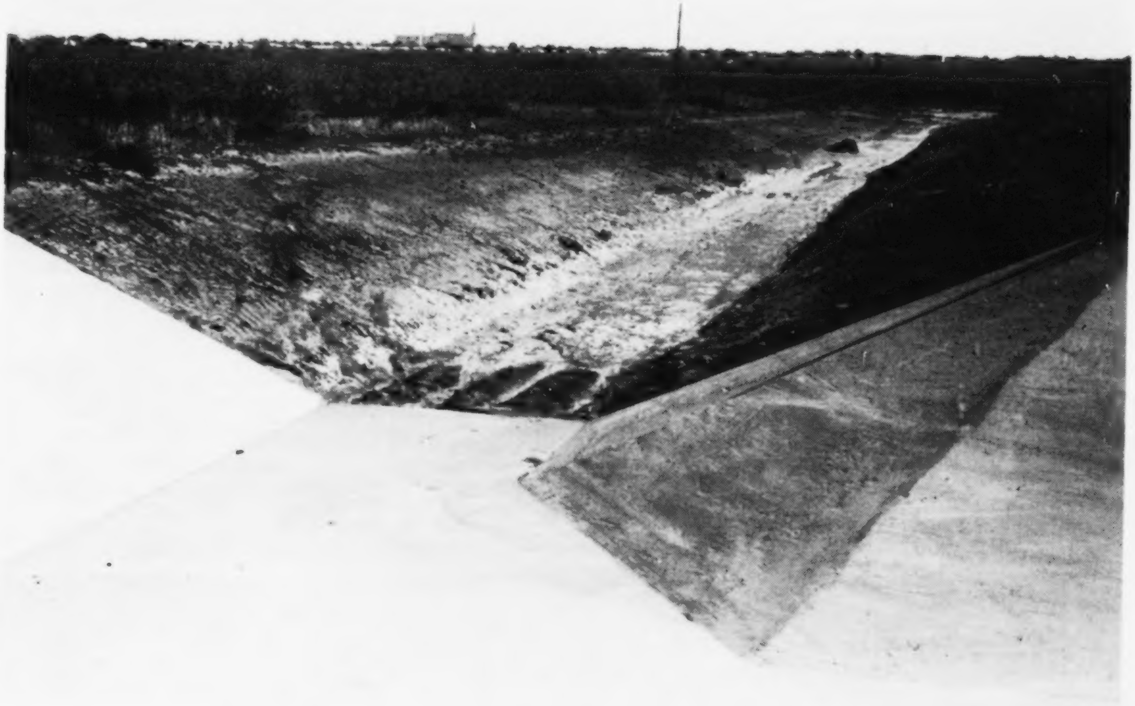

Figure 25. This drainage ditch, with a concrete apron for protection from scouring and erosion, channels highway right-of-way runoff into a playa basin (upper right). Increased open water, soil moisture, and native vegetation benefits both aquatic and terrestrial wildlife. (Photo by Nelson and Assoc., Inc., Boulder, CO).

basin, or a combination of these features, by regulating water flow through the runoff collection box. Diversion of water into the trench or furrow system can be used to promote native annual and perennial vegetation and irrigate food and cover plantings for upland game birds and mammals. Channeling the runoff into the playa interior increases open water and aquatic vegetation, favored by waterfowl. During the fall and winter months, migrant ducks, geese, and cranes are attracted by open water, especially where waste grain from harvested fields or other food sources are nearby. Pheasants seek tall, dense patches of vegetation during the cold season. Nesting ducks prefer cover vegetation over or near water in the spring or summer.

Limitations

Channeling road runoff into playa watersheds or basins may have some limitations, particularly where crops grown on the playa floor would be flooded out by direct diversion of storm flows. Basin or watershed modification may be impractical in cropland where tillage would disrupt infiltration trench or furrow systems. However, highway storm runoff management for wildlife habitat and farming can be balanced and compatible.

Performance

Documentation of results from diverting roadside runoff into playas for maintenance of wildlife habitat is lacking. Wildlife populations can be attracted and increased with various crop, shelterbelt, and irrigation management practices. The management of surface runoff can be expected to have similar results.

Costs

Expenses for the control and distribution of roadside runoff include surveying, soil excavation, sod establishment, and rock or concrete work. These expenses vary considerably between sites. Sprigging grass for soil stabilization may cost $\$50$ per acre (U. S. SCS 1982). Excavation may average $\$0.60$ to $\$1.00/\text{yd}^3$ or $\$0.25$/linear ft, in the case of a trench or large furrow. Rock and wire baskets for bank stabilization cost as much as $\$60/\text{yd}^3$. Rock and brush check dams cost an estimated $\$21/\text{yd}^3$. Concrete ditch lining, including pad construction and ditch shaping, is estimated to cost $\$130/\text{yd}^3$. Unformed, reinforced concrete may cost $\$85/\text{yd}^3$; formed, reinforced concrete may be at least $\$230/\text{yd}^3$.

Maintenance

Periodic maintenance of runoff collection and distribution systems is needed. Besides repairing erosion rills and gullies, excess sediment needs to be removed and weeds and brush cleared, preferably in midsummer, from ditches, trenches, or furrows to ensure proper flow.

References

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USE OF MUNICIPAL SEWAGE EFFLUENT TO MAINTAIN HABITAT

Purpose

Treated municipal sewage effluent can be discharged into a single playa or series of playa basins, resulting in expanded wetland habitat for aquatic and terrestrial wildlife.

Description

Water-level management is the controlling factor in maintaining wetland habitat, especially in the semiarid Southern Great Plains. Maintaining the water level with treated sewage can sustain or enhance playa wetlands near urban areas (Figure 26). The sewage must be partially treated before discharge into a playa to reduce excess nutrients and toxic substances and eliminate bacterial and viral pathogens. The treated effluent can be moved by gravity or pumped from holding lagoons into a ditch or pipeline that discharges into the playa basin at times and in amounts necessary to maintain water levels suitable for habitat needs. Discharging effluent during cool weather avoids the blooms of algae that may result from high nutrient loads in warm weather.

Sustaining playa water from 1 to 3 ft deep in the fall through spring can attract migratory waterfowl. Conversely, maintaining an 8 to 12-ft depth at the center of the basin allows development of a limited sport fishery. However, playas used to hold treated sewage effluent should be allowed to dry out periodically, possibly in alternate years. A drying period during late spring to midsummer would release nutrients by oxidation and improve the playa's biological productivity. Several interconnected playas, managed to dispose of sewage effluent while improving wildlife habitat, would allow the annual rotation of a dry basin.

Limitations

The main limitation to the disposal of sewage effluent in playa basins is the difficulty in balancing the water level appropriate for habitat management purposes with sewage disposal needs. Another limitation to using effluent is the potential for overfertilization and disease. Excess nutrients can result in undesirable growth of algae that, in turn, can deplete the dissolved oxygen and degrade aquatic habitat. Persistent shallow water can contribute to increased mosquito production, possibly resulting in a higher incidence of encephalitis. Botulism can result in avian mortality during warm weather if the discharged effluent has a high level of organic contents and the playa basin has exposed mudflats. Potential seepage of sewage effluent into the

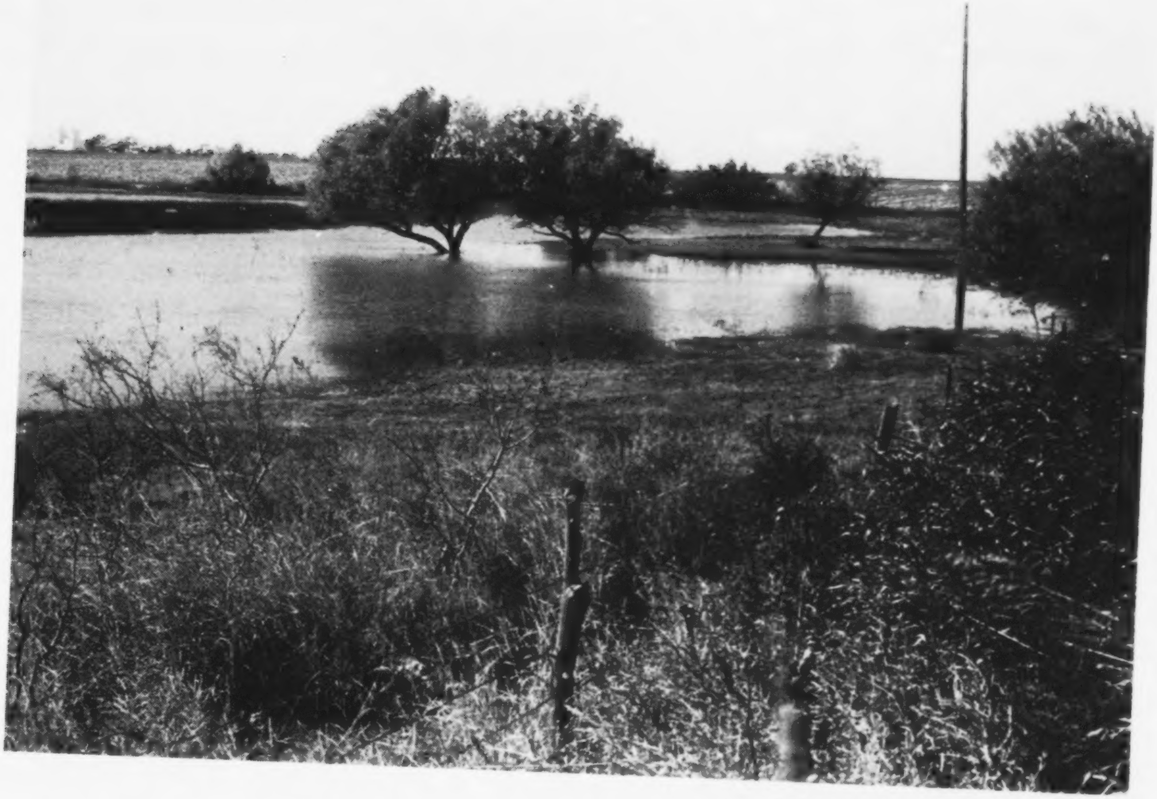

Figure 26. A playa lake near Lubbock, Texas, sustained with treated effluent discharged from municipal sewage lagoons, provides excellent open water habitat for migratory waterfowl. Increased soil moisture around the playa enhances terrestrial habitat for upland birds and small mammals. (Photo by Nelson and Assoc., Inc., Boulder, CO).

aquifer because of high water overlying the upper basin where the playa floor is more permeable could necessitate lining the bottom of the basin with additional clay (up to 2 ft).

Performance

Several towns and cities in the Great Plains use playa basins and prairie potholes for disposal of treated sewage effluent. Maintenance of open water and increased cover vegetation at a playa near Lubbock, Texas, where treated effluent has been impounded, has greatly improved habitat for waterfowl, upland birds, and small game. Disposal of large volumes of sewage effluent for irrigation has led to overapplication on croplands and considerable seepage into ground water; this situation needs to be avoided.

Costs

Discharge of sewage effluent into playa lakes involves the construction of a transmission ditch or pipeline. A pumping facility may also be required, and additional pumping will be necessary if the playa water is reused in irrigation. A professional manager may be needed to ensure a balance among sewage disposal, irrigation, and habitat management objectives.

Maintenance

Playas that receive treated sewage effluent require periodic maintenance of pumping and transmission facilities. Some dredging of settled solids at long intervals may be necessary to maintain the holding capacity of the basin and reduce the presence of mud flats. Periodic drawdowns may be desirable to allow for oxidation and release of nutrients. Fish stocking may be necessary to maintain a sport fishery.

References

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RESTRICTON OF OIL AND BRINE DISPOSAL TO PRESERVE HABITAT

Purpose

Disposal of waste oil and brine that results from petroleum production on the Llano Estacado (Southern High Plains) into playa basins can be restricted to help preserve playa wildlife habitat.

Description

Disposal of oil drilling and pumping wastes, primarily brine, in playa basins can seriously pollute the water with dissolved solids, chlorides, hydrocarbons, acids, and heavy metals. Ground water may become severely contaminated by seepage of saltwater from playas, and cover vegetation may be damaged or destroyed. Animals and food organisms that come into contact with the wastes can become debilitated or even die; salt encrustation of waterfowl or damage to their plumage from oil and grease can result in mortality (Figure 27).

Freshwater or slightly brackish playas are much more susceptible to water quality deterioration than are naturally saline playas, which already have limited habitat value--their greatest use is as resting sites by sandhill cranes. The problem of salinity is compounded when playas impounding waste brine remain filled after natural playa lakes have evaporated, thus attracting waterfowl. When oil field brine cannot be injected into deep wells for disposal, its disposal into playas can be confined to a few basins that are already highly saline and have limited potential for wildlife habitat management.

Limitations

Restriction of petroleum production wastes from entry into playa basins results in costlier waste disposal by deep underground injection into wells, where feasible.

Performance

Restriction of oil-bearing brine disposal into playa basins will help preserve wildlife habitat by preventing pollution and degradation of water, food, and cover.

Costs

The expense of finding alternative means of processing and disposing of waste brine and associated crude oil may be considerable, particularly with deep injection wells. Selecting more remote playas with low intrinsic value for wildlife as disposal sites could require longer-distance hauling by tanker truck or a longer pipeline.

Maintenance

Oil and brine waste disposal in playas, unless accomplished by injection into wells, requires maintenance of oil and brine separator pits at the playa disposal site.

References

Brewster, J. 1979. Operators present testimony in defense of playa lake disposal. Drill Bit 28(4):26-27.

Figure 27. This shoveler died after its plumage was coated with crude oil in a Texas High Plains playa where waste oil and oil field brine were dumped as an economical alternative to underground disposal. Salt toxicity apparently also was a factor in waterfowl mortality at this playa lake. (Photo by Defenders of Wildlife.)

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FISH AND WILDLIFE MANAGEMENT PRACTICES

PUMPING OF GROUND WATER TO MAINTAIN HABITAT

Purpose

Supplemental pumping from ground water supplies to maintain stable water levels in playas can improve and extend waterfowl and fish habitat year-round, while suppressing conditions that favor botulism.

Description

Ground water can be pumped to sustain open water habitat during selected seasons or even year-round and to promote emergent vegetation valuable as wildlife cover and food (Figure 28). Supplemental pumping is most feasible where a well and pumps have already been installed near a playa basin for crop irrigation or livestock watering, and there are no other reliable water sources for wildlife. Pumping ground water is most beneficial during droughts when most playas are dry, waterfowl resting sites are very scarce, and moisture needed by food- and cover-producing plants is otherwise unavailable. Pumping may be most worthwhile if the playa has been modified with an irrigation water storage pit. Routine seasonal pumping may be practical if the playa lake normally maintains some open water during most of the year and otherwise is suitable for management as a waterfowl refuge or hunting preserve.

Pumping in the fall through late winter creates an open water habitat that is attractive to migrating geese, cranes, and ducks as overwintering habitat (Figure 29). Irrigation water pumped before planting winter wheat in the fall or during its early spring growth can be diverted from peripheral playa storage pits into the playa interior via ditches or into a diked sector within the playa basin so that controlled flooding of at least part of the basin is possible. Diked systems for water-level management may result in enough stability to avoid many nesting losses to natural spring flooding. Some species of ducks--mallard, redhead, pintail, and teal, for instance--may nest in the area if open water is present and the water regime managed to support food and cover vegetation during the previous growing season. Pheasants, doves, and quail can be attracted to playas if there is enough collected water to produce weedy vegetation around the shoreline. Stocking a sport fishery may be feasible if management for overwintering and reproduction of waterfowl results in a permanent playa lake.

Submerged aquatic plants favored by waterfowl as food, such as pondweed or water milfoil, require water-level stability during the growing season for

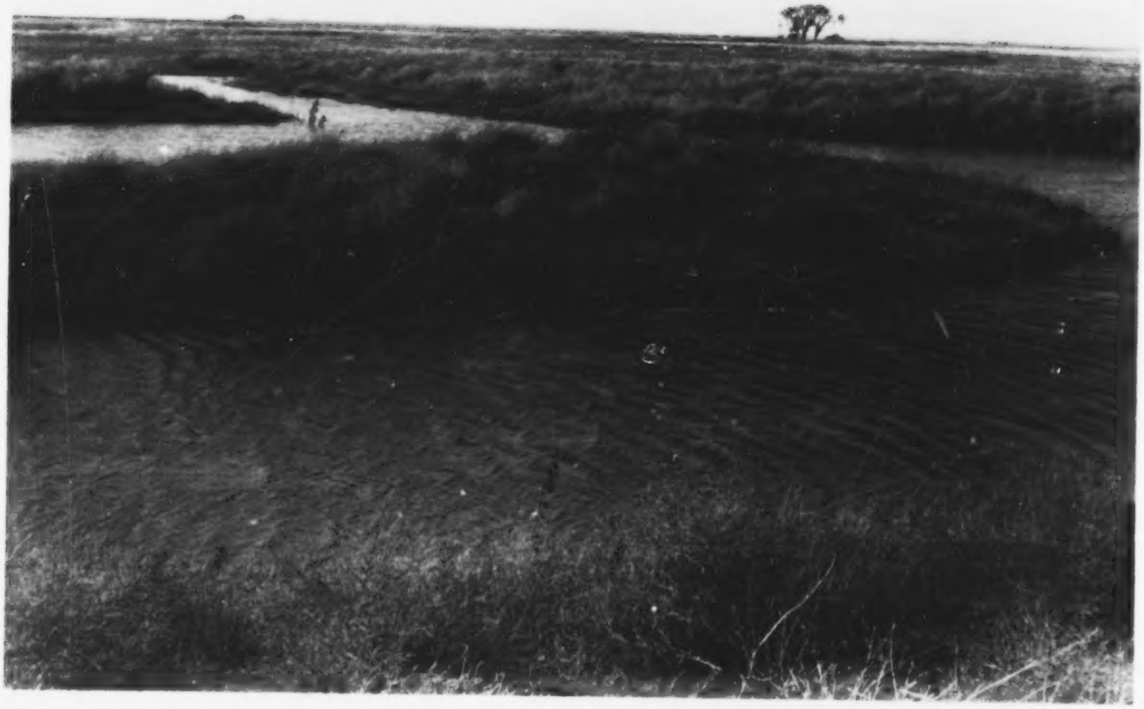

Figure 28. This rangeland playa lake, managed experimentally by the U. S. Forest Service to attract overwintering waterfowl, receives irrigation tailwater from a sorghum field through a trench (upper left). Ground water will be pumped by wind energy to supplement tailwater and natural runoff, thereby stabilizing the water level throughout the year. A smallmouth bass fishery may be feasible if this plan is carried out. (Photo by Nelson and Assoc., Inc., Boulder, CO).

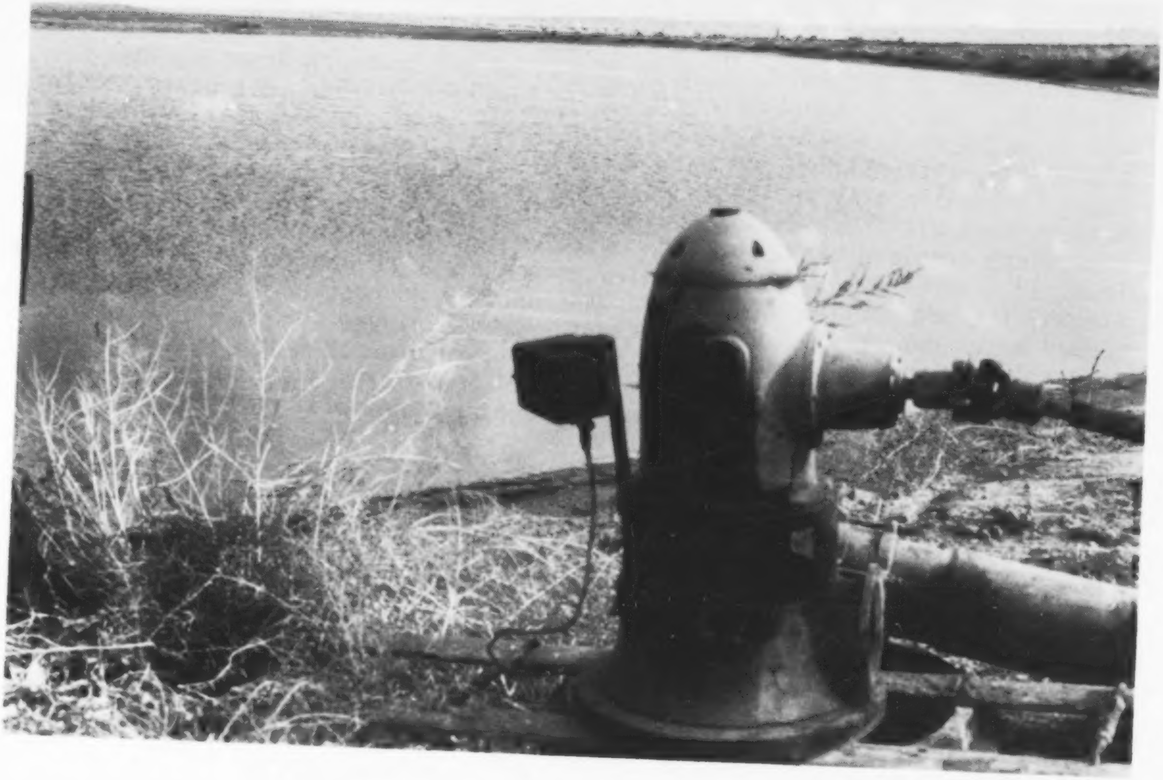

Figure 29. On the Mike Smith farm near Hereford, Texas, a large playa lake is maintained as a private refuge for migrant geese, cranes, and ducks in the Central Flyway by tailwater catchment and pumping of ground water in the fall and winter. (Photo by Nelson and Assoc., Inc., Boulder, CO).

seeding and proper growth; a near-shore depth of 1 to 2 ft during the growing season is optimal. Emergent vegetation, such as annual smartweed which provides high quality food for migratory waterfowl, can be encouraged at playas by supplemental water pumping to cover shallow mudflats early in the growing season. The water level can be allowed to subside at mid-June to encourage continued growth of these broad-leaved emergent plants.

An artificial source of water is essential for creating and maintaining certain types of wetland habitat in playas of the Southern Great Plains (Table 4). This is particularly true for the narrow-leaved emergents, cattail and bulrush, that provide excellent overwinter cover for pheasants, roosting blackbirds, cottontails, coyotes, and other terrestrial wildlife. Work at Texas Tech University indicates that each additional 2.5 acres of a cattail-bulrush community supports an additional 15 pheasants in the wintering population where cropland playas are concentrated (Guthery, pers. comm.). If at least 12.5 acres of the cattail-bulrush community are present on one of these playas, the pre-hunting pheasant population will approach 200. Likewise, pumped water can be used to attract waterfowl to playas (Table 5). Flooding to support growth of smartweeds may be necessary once or twice each summer, depending on prevailing rainfall. If these same playas are flooded to a depth not exceeding 1.5 ft during the fall and winter, they will be used readily by dabbling ducks.

Water-level decreases during the late summer and early fall may result in large die-offs of snails, leeches, and other invertebrates, releasing botulism bacteria present in their carcasses. Botulism poisoning in waterfowl, upland game birds, and other wildlife can occur if they consume contaminated carcasses. Botulism outbreaks at playa basins can be suppressed by keeping water levels stable and preventing the exposure of mudflats during hot weather. The incidence of botulism can be further controlled by using dikes to divide the playa into sectors, allowing greater flexibility in water-level management.

Limitations

The main limitations to supplemental ground water pumping for maintenance of fish and wildlife habitat are the costs of electric power or natural gas fuel and the potential for increased mosquito production. The energy costs can be at least partially offset by income from increased hunting opportunities. Mosquito production can be controlled by stocking mosquito fish in more permanent waters or using granular insecticides that are gradually released at levels toxic to mosquitoes, but not to fish and wildlife.

Performance

Seasonal pumping of ground water into suitable playa basins to supplement storm runoff and irrigation tailwater will dramatically improve aquatic and wetland habitats. Such improvement can be observed at playas where feedlot or sewage effluent is collected. The overwintering of waterfowl in large numbers has resulted from pumping ground water into large playa lakes in the fall and winter.

Table 4. Wetland and aquatic plant species expected to occur more frequently, or at all, on playas that receive artificial inputs of water, either pumped ground water or irrigation tailwater (Guthery, pers. comm.).

Plant species	Value to wildlife
Annual sunflower	Seeds are important for upland game birds and songbirds.
Arrowhead	Seeds and tubers are food for a variety of waterfowl.
Bulrush	Provides overwinter cover for pheasants and cottontails; food for marsh birds, shorebirds, and songbirds; seeds are important food for dabbling ducks and geese.
Cattail	Provides overwinter cover for pheasants; nesting cover for diving ducks; seeds and rootstocks are food for ducks and geese.
Devilweed	Provides prime cover for upland game birds, songbirds, and small mammals.
Kochia	Provides nesting and escape cover for pheasants and small mammals; protein-rich forage for deer and pronghorn antelope.
Lambsquarters	Seeds are food for upland game birds, songbirds, and small mammals.
Pondweed	Seeds and foliage are food for a variety of waterfowl, marsh birds, and shorebirds.
Smartweeds	Seeds are excellent food for dabbling ducks.
Spikerush	Seeds, culms, and tubers are food for a variety of waterfowl, marsh birds, and shorebirds.
Water clover	Provides food for diving and dabbling ducks.

Table 5. Approximate month-to-month relationships between duck use of playas and the amount of surface water available (Guthery, pers. comm.).

Month	Ducks per day per acre of water
September	82
October	107
November	16
December	5
January	8
February	247
March	57

Costs

The unit costs of pumping ground water are quite variable, depending on the type of equipment, kind of energy, depth of the water table, and the volume being pumped. The average 1982 cost of pumping ground water, as determined by the Department of Agricultural Economics, Texas Tech University, was $70 to $90 per acre-ft, depending on the engine brake horsepower and pumping efficiency (Texas Tech Univ. 1982). This cost includes the investment in equipment and was based on a pumping rate of 900 gal/min, about 1,000 hours of operation in a year, and a depth to water of 200 ft (plus a 60-ft drawdown).

Maintenance

The maintenance of pumping equipment is the major upkeep necessary with this management practice. Pumps and valves require periodic lubrication; pipes and risers may need occasional repair.

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DISTURBANCE OF SOIL TO ENHANCE HABITAT

Purpose

Soil disturbance or scarification--roughening and loosening the soil surface or breaking the hardpan by mechanical means, such as chiseling, disking, or pitting--in selected areas of playa watersheds can benefit wildlife by increasing the growth and variety of native annual vegetation useful as cover and food.

Description

Diversification of food and cover vegetation resulting from soil disturbance is useful when plant variety is poor. It also reinforces other habitat improvement techniques, such as food and cover plantings and building escape shelters. Breaking the soil surface from 3 to 6 in deep by plowing, disking, chiseling, knifing, or pitting in the early spring (March-April) increases water infiltration from storm runoff, enhancing the germination of volunteer or disturbance-type vegetation (Figure 30). Plants like kochia, sunflower, amaranth, and lambsquarters, which are associated with soil disturbance, are necessary to game birds and other wildlife. The production of weedy vegetation decreases substantially in 2 or 3 years after soil disturbance, so periodic redisturbance is necessary to maintain this kind of habitat.

Chiseling and pitting are usually done in rangeland and require special equipment that either punches multiple holes or digs a series of shallow depressions (2 ft^2 by 6 in deep) into the soil surface (Figure 31). Several types of equipment can be used at either cropland or rangeland playas to knife or furrow strips 50 ft or more in length and up to 8 or 10 ft wide. Playa watershed erosion can be reduced by cutting strips or a large contour trench (2 or 3 ft deep) perpendicular to the slope of the watershed or to prevailing storm winds. Several parallel strips cut approximately 30 ft apart can increase plant variety and interspersion; these strips complement food and cover plantings.

Disturbance-type vegetation can be sustained by scarifying half or one side of each strip in alternate years; this practice produces two different stages of plant succession, in addition to whatever is present on adjacent

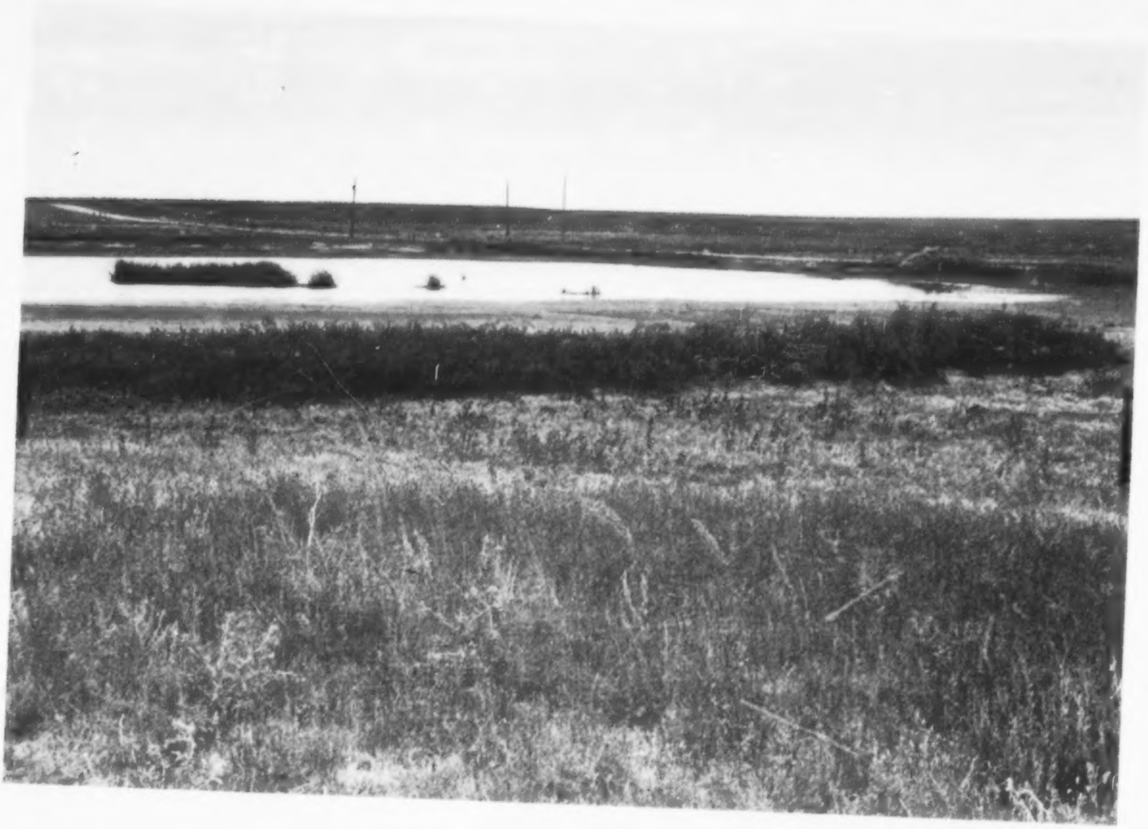

Figure 30. Disking in a 25-ft wide strip stimulated early growth of native volunteer vegetation (foreground) between an upslope shrub row and a downslope brush row shown along the contour trench (across middle of photo). The purpose of soil disturbance was to develop natural cover and food for small game and other wildlife at this demonstration playa near Clovis, NM, being managed under an SCS cost-sharing program. (Photo by Nelson and Assoc., Inc., Boulder, CO).

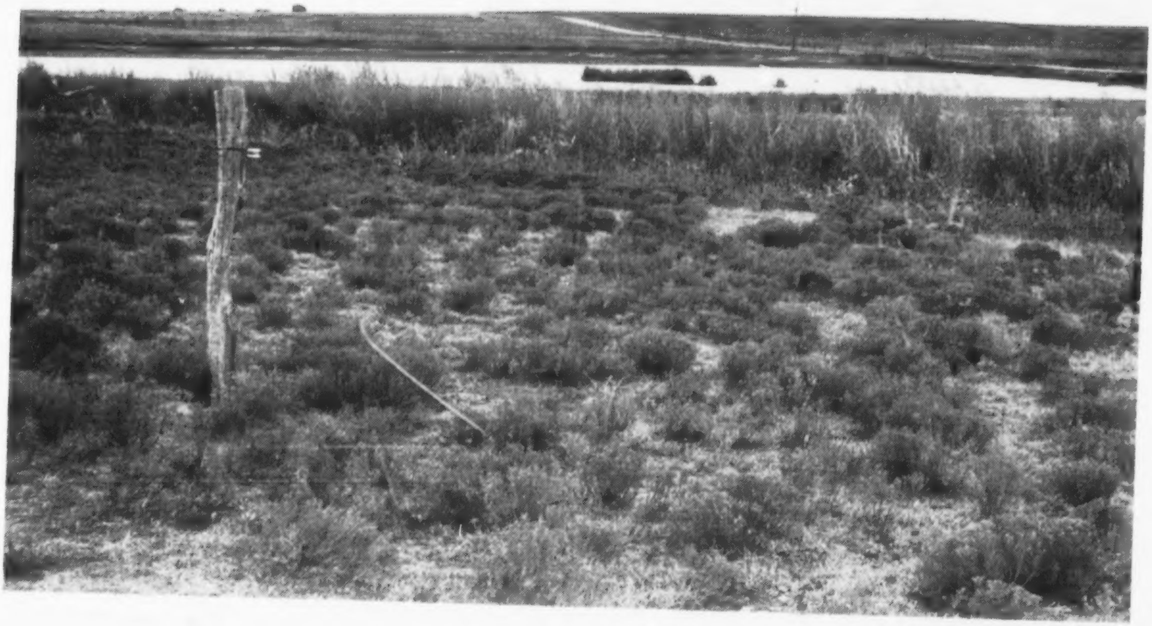

Figure 31. At a playa demonstration project in eastern New Mexico, the SCS has combined soil disturbance with food and cover plantings to increase the abundance and diversity of habitat for game and nongame birds. The upslope rangeland (foreground) was chiseled to increase the spread of midgrasses, such as weeping lovegrass, which was broadcast in front of the shrub row (across middle of photo) and behind the electric fence. (Photo by Nelson and Assoc., Inc., Boulder, CO).

land. The strips can be scarified in either fall or spring. Spring scarification tends to discourage cool-season forbs, which provide important nutrients for the forthcoming reproductive period. Sites with sandier soils should be scarified for maximum protection of forbs. It is important that the sod be thoroughly broken and mixed for a desired response from forbs. Broadcasting of clover or sorghum into patches of disturbed soil may provide competition that reduces crop weeds.

Limitations

Drawbacks to soil disturbance stem from the opinion of some land managers that increased annual vegetation will spread weeds into crops, and soil scarification will accelerate erosion. A weedy appearance in the disturbed areas of croplands may be interpreted as poor land management. Erosion can be reduced by disturbing the soil in advance of heavy spring rainfall to encourage rapid growth of cover vegetation and by locating scarified strips along contour lines.

Performance

Encouraging vegetative production by soil disturbance has been shown to be an effective management practice to enhance wildlife habitat where natural food and certain types of cover are sparse. Native vegetation, encouraged by soil scarification in playa watersheds, can result in a diverse, high quality habitat favoring more diverse and productive wildlife populations. Knowledge of the response of various plants to soil disturbance is important in habitat management. The vegetation requirements of target wildlife species must be tied to plant responses to soil scarification (Table 6).

Costs

The costs of soil scarification are similar to those of soil cultivation: about $10 per acre for plowing; $5.50 per acre for disking (U. S. SCS 1982). Pitting, chiseling, and knifing require special implements; grassland pitting costs about $10 per acre, knifing costs about $3.75 per acre, and chiseling costs around $0.55 per acre per inch. These costs vary locally and may be offset by ASCS or SCS cost-sharing conservation programs or reduced by renting specialized equipment from farm cooperatives.

Maintenance

The effects of soil disturbance in encouraging weedy volunteer vegetation are relatively short-lived and require periodic redisturbance to maintain vigorous production. Soil scarification every other year should be sufficient to maintain wildlife strips or patches. New soil disturbance should occur next to old patches or strips, if at all possible, to reduce losses from nesting in cover from the previous year.

References

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Table 6. Response of common rangeland plants to spring disking of a sandy loam site in the Texas High Plains (Guthery, pers. comm.).

Plant group and species	Importance to wildlife	Response to disking
Grasses		
Blue grama	Warm-season forage	Decrease
Buffalograss	Warm-season forage	Decrease
Fall witchgrass	Seeds	Decrease
Hairy grama	Warm-season forage	Neutral
Hall's panic	Seeds	Increase
Rescuegrass	Winter greens	Decrease
Sand dropseed	Cover for ground nesters	Decrease
Sideoats grama	Cover for ground nesters	Decrease
Threeawns	Cover for ground nesters	Decrease
Forbs		
Amaranth	Seeds and brood cover	Increase
Annual broomweed	Seeds and screening cover	Decrease
Annual sunflower	Seeds and brood cover	Increase
Gordon's bladderpod	Cool-season greens; seeds	Decrease
Illinois bundleflower	Seeds	Neutral
Plantain	Cool-season greens	Decrease
Scarlet gaura	Brood and screening cover	Neutral
Scarlet globemallow	Excellent pronghorn forage	Increase
Western ragweed	Seeds and brood cover	Increase

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ESTABLISHMENT OF IRRIGATED FOOD AND COVER CROPS

Purpose

Food and cover plantings in the semiarid Southern Great Plains may require irrigation in order to become well established. The establishment of appropriate vegetation on playa watersheds can greatly improve wildlife habitat and attract diverse populations of game and nongame animals.

Description

Low abundance and poor quality of food and cover may limit wildlife near playa basins. A variety of animals can be attracted by planting vegetation that produces palatable foliage, seeds, nuts, and fruit, and develops cover dense enough to provide storm shelter and allow escape from predators. Plant species should be selected that will increase habitat diversity. Areas that lack grain crops may benefit by planting (and not harvesting) corn and grain sorghum, which will produce an abundant food source and adequate cover during the critical winter months. Establishing crop patches as food and cover serves a double purpose; wildlife benefits and the cultivated crops help prevent cropland weeds. If an area already provides a supply of waste grain after harvest, then planting fruit-, nut- and cover-producing species may be more appropriate; native plant species are preferred wherever possible.

Shelterbelts or windbreaks established for soil and crop protection can also benefit wildlife if suitable species are used. Plant species used in a current SCS-sponsored playa habitat improvement project in eastern New Mexico include cottonwood, Russian olive, Mondell pine, native plum, skunkbush, juneberry, sand cherry, cotoneaster, honeysuckle, weeping lovegrass, and Japanese millet (Figure 32).

Several factors should be considered in establishing food and cover plantings. Site considerations include soil suitability, exposure to sun and wind, proximity to the playa basin, appropriate planting pattern, and the ease of irrigation. Many plants are limited to soils having specific texture, moisture, and chemistry. SCS agents can help with species selection and soil

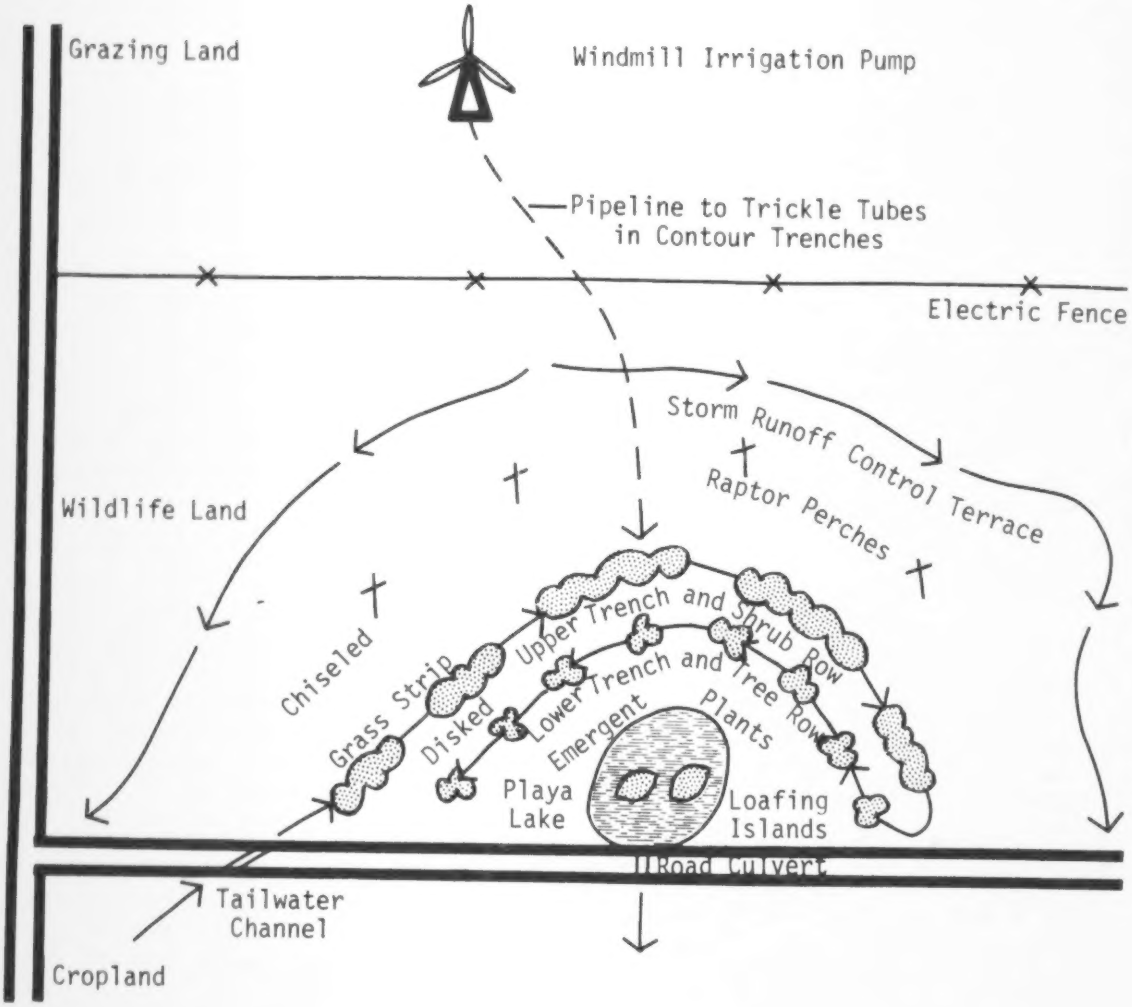
Grazing Land
Windmill Irrigation Pump
Pipeline to Trickle Tubes in Contour Trenches
Electric Fence
Storm Runoff Control Terrace
Raptor Perches
Wildlife Land
Chiseled
Grass Strip
Disked
Upper Trench and Shrub Row
Lower Trench and Tree Row
Emergent Plants
Playa Lake
Loafing Islands
Road Culvert
Tailwater Channel
Cropland

Figure 32. Site plan for a playa habitat management project in eastern New Mexico, supported with cost-sharing funds and technical guidance from the U. S. Soil Conservation Service. The irrigated food and cover plantings and other project features are designed primarily to attract upland birds and waterfowl. (Drawing adapted by Nelson and Assoc., Inc., Boulder, CO, from field observations and U. S. Soil Conservation Service files.)

suitability tests. Food and cover patches should be placed where they will receive good sun exposure during winter, yet be sheltered from prevailing storm winds. Wildlife plantings throughout the playa watershed will reinforce the benefits of water and natural vegetation on the playa floor. The planting design affects the utility of the food and cover patches for wildlife. Optimum designs result in a large amount of "edge" effect, with long boundaries between open spaces (shortgrasses) and taller, thicker grass, weed, and brush cover. Planting in several long, narrow, parallel rows or corridors provides more usable habitat than large blocks of vegetation. The corridors create the intermixture of cover and open space generally favored by wildlife. Blocks of vegetation may be appropriate when planted on islands in playa lakes.

Irrigation is usually needed to propagate and maintain wildlife patches or corridors. Food and cover plantings can be made along contour trenches (ditch and berm) designed to collect and concentrate surface runoff, irrigation tailwater, or roadside runoff at the base of the vegetation (Figure 33). The contour trenches can be placed so that they distribute irrigation water around the dry upper slopes of a playa. Irrigation pipelines can originate from a pumped storage pond located above the plantings, so that gravity feed to trickle tubes and emitters can be used for efficient watering of individual trees and shrubs (Figure 34).

Limitations

There are several possible limitations to establishing wildlife food and cover plantings. Expenses may be high for plant materials, site preparation, irrigation energy and equipment, fencing, and maintenance. Irrigation often is essential to success, and the plantings are not likely to survive without protection from animals and competing vegetation. Successful cultivation of many native species is difficult, and great care needs to be taken with species selection and site preparation.

Performance

The success of food and cover plantings depends a great deal on site and soil suitability, appropriate plant selection, proper irrigation, physical protection, and diligent maintenance. The degree of success for cultured food and cover strips and patches is measured in terms of an actual increase in the abundance of target wildlife. Certain plant materials are still considered experimental, such as planting cuttings from mature cottonwood trees.

Costs

Costs associated with food and cover plantings include site preparation, irrigation systems, plant materials, fencing, and maintenance. The average cost per acre from a sample of Great Plains reservoir projects with food and cover plantings were $86, with a range of $26 to $175 in 1977 dollars (Nelson, Horak, and Olson 1978). The annual operation and maintenance costs ranged from $1 to $53 per acre, with an average expense of $21. The installation costs at a current playa demonstration project are documented in Table 7.

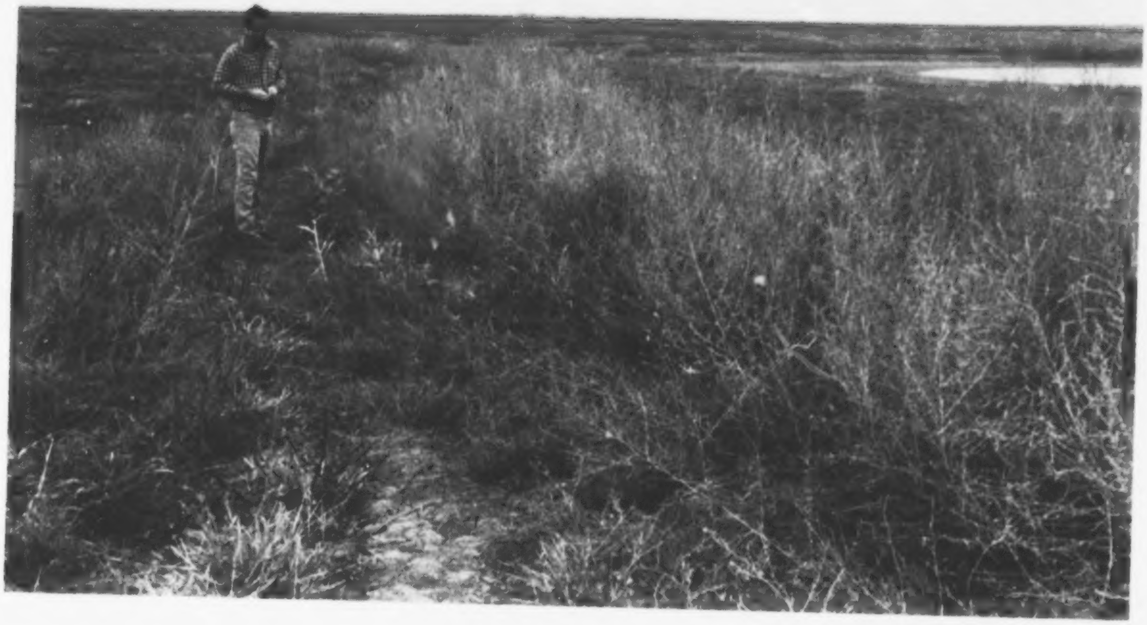

Figure 33. Contour trench built along the upper slope of a playa basin in eastern New Mexico, used to channel irrigation tailwater and surface runoff to irrigate food and cover shrub plantings in the trench. The heavy cover (on the right) is volunteer vegetation, mostly kochia, stimulated by soil disturbance. Supplemental irrigation is provided by placing a flexible trickle tube in the contour trench. (Photo by Nelson and Assoc., Inc., Boulder, CO).

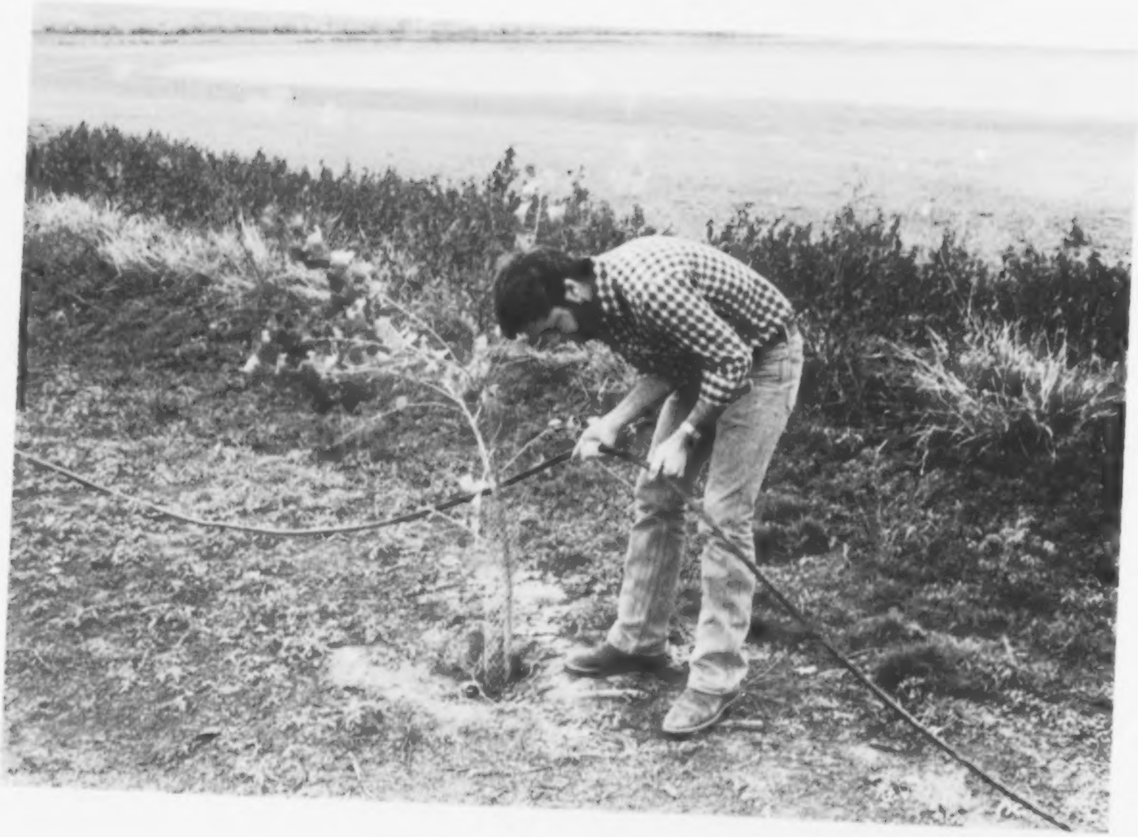

Figure 34. Cottonwood tree cuttings are planted in a contour trench circling an eastern New Mexico playa where aquatic and terrestrial bird habitat is being developed. The trench carries natural runoff and irrigation tailwater, which waters the tree cuttings, and a flexible trickle tube to water each tree through an emitter (shown held in the photo) during dry periods. The tube is fed by an upslope, wind-powered, pumped storage unit. (Photo by Nelson and Assoc, Inc., Boulder, CO).

Table 7. Quantities and costs of tree and shrub planting and irrigation system installation at a playa project in Curry County, New Mexico, with SCS guidance and cost-sharing (U. S. SCS).

Description	Quantity	Total cost	Cost per plant
Tree planting			
Mondell pine	58	$174.00	$3.00
Equipment--maintainer	1 hr	35.00	0.60
Equipment--tractor/auger	2 hr	20.00	0.34
Labor (1 person)	8 hr	32.00	0.55
Total		$261.00	$4.50
Shrub planting			
Russian olive	20	$40.00	$2.00
Juneberry	50	37.50	0.75
Sand cherry	50	20.00	0.40
Honeysuckle	50	20.00	0.40
Cotoneaster	50	20.00	0.40
Labor (2 persons)	32 hr	128.00	0.58
Total		$265.50	$1.21
Irrigation system			
Pipe (½-in)	2,900 ft	$203.00	$0.92
Pipe (1¼-in)	600 ft	120.00	0.55
Filters	3	50.24	0.23
Emitters	100	40.00	0.18
Miscellaneous fittings		146.85	0.67
Labor (3 persons)	72 hr	288.00	1.31
Total		$848.09	$3.85

Maintenance

Wildlife cover and food patches or strips need to be actively protected and maintained for the first 3 to 5 years following planting. Protective wire or plastic guards around tree stems may be necessary to prevent damage from wildlife, and fencing may be needed to exclude livestock. Maintenance includes periodic upkeep of irrigation equipment and earth structures and clearing away of competing vegetation. Replacement of unsuccessful plants on an annual basis is needed in order to obtain desired results.

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CONSTRUCTION OF SHELTER PILES OR STRUCTURES AS COVER

Purpose

Brush or rubble piles or constructed shelters provide loafing, roosting, and nesting sites protected from the weather and predators. Shelter pile cover is especially valuable during winter months when vegetation is lacking or where protected natural areas are scarce. Building shelters at playas where scarce escape and nesting cover limits the abundance of wildlife should increase the habitat carrying capacity for upland game birds, particularly quail, many songbirds, and small mammals.

Description

Brush piles can take several forms, such as a "lean-to" or "tepee," depending on local materials, available labor for construction, and type of appearance that is locally acceptable (Figure 35). Piles generally consist of clusters of leafy branches or tops of trees and shrubs. Mesquite and other brushy vegetation may be cut in half laterally, with the top portion resting on the ground and wired to the bottom half. Thorny types of brush are preferable for discouraging predators. Piles can be made with discarded Christmas trees or brush stacked against a horizontal log (lean-to) or vertical pole (tepee) or even just stacked in the corners of fields. Loose rolls of woven

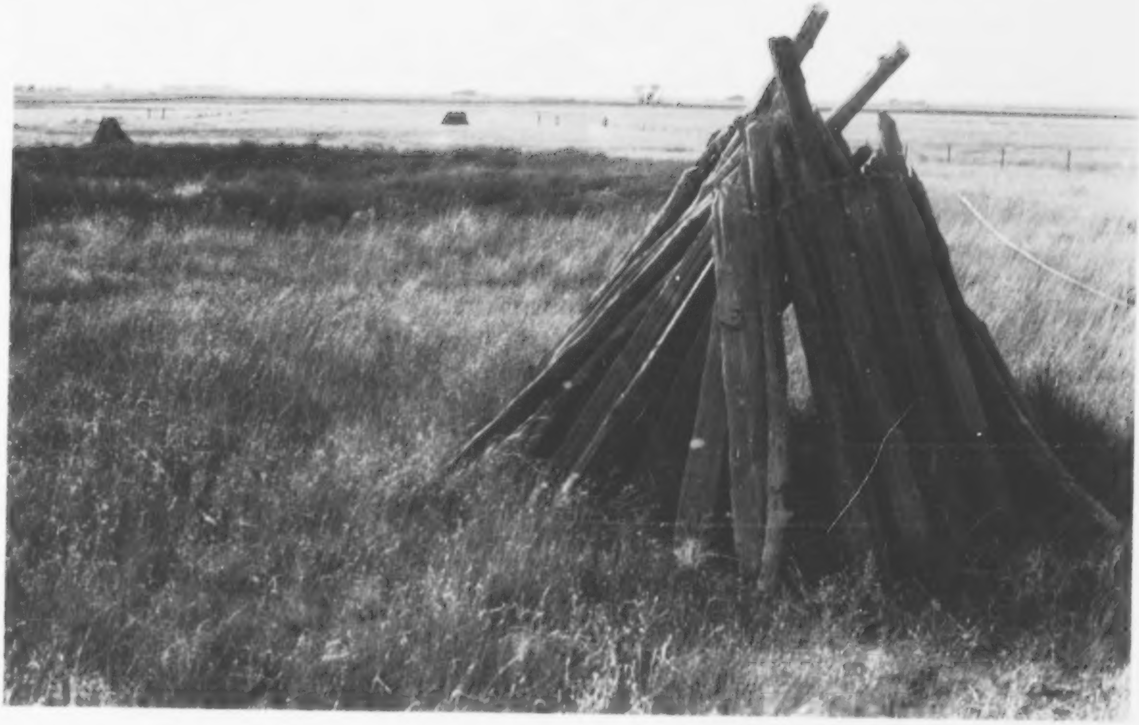

Figure 35. Several tepee shelters made of fence posts placed near a rangeland playa in the Rita Blanca National Grasslands by the U. S. Forest Service provide cover primarily for scaled quail. One tepee for each 7 acres is considered adequate spacing. (Photo by Nelson and Assoc., Inc., Boulder, CO).

wire can provide a good foundation for a brush pile, particularly when covered with woody vegetation or vines. As an alternative to using brush, fence posts can be formed into a tepee or cinder blocks piled in a loose structure with entrances and internal spaces.

Shelter piles should be built with enough internal space to allow access by the targeted wildlife species, but hinder access by predator species. Size and stability of shelter piles are important to their utility. Piles should be large enough, perhaps 6 ft on a side or at least 3 to 5 yd^3, to provide escape or protection cover for small wildlife and strong enough to withstand predators, livestock, and the weather (Webb and Guthery 1982). A number of shelter piles are needed at playas that lack cover, grouped or spaced so that several cover alternatives are available for animals. Piles for upland game birds should be placed within 200 ft of other escape cover and no more than 0.25 mi from water. Ideally, shelter piles should be located at sites with good sun exposure and wind protection.

Shelters can also be built with rough limber and sheet metal; one design calls for a sloping corrugated metal roof that collects rainwater into a pan as a drinking water supply for pheasants, quail, and mourning doves (Figure 36). Quail shelters combine this water source (called a guzzler) with a supply of grit. Such a quail shelter may be combined with fence-post tepees on rangeland acreage that is fenced to exclude cattle and seeded with midgrasses to improve the cover value.

Limitations

A major limitation to building brush piles in the Southern Great Plains is the lack of suitable materials. Destruction of windbreak trees to construct shelters would be at odds with conservation goals. Brush piles generally furnish only temporary cover; in most cases, it is more desirable to plant permanent cover. Some forms of shelter piles may not be visually attractive. A possible liability of shelter piles is their potential for harboring undesirable animals such as rodents or rabbits, contributing to an increase in their populations.

Performance

Installation of shelter piles or similar structures at playas can benefit a variety of small wildlife where suitable escape and nesting cover is in short supply, particularly upland game birds. One recent study indicated that brush piles in King and Dickens Counties, Texas, had heavy use by bobwhite and scaled quail and probably added to the numbers of birds present because of increased production and survival (Webb and Guthery 1982). An estimated 85% of playas in the Southern Great Plains lack the type of cover that could be provided by artificial shelters.

Costs

The costs of shelter piles or structures are highly variable, depending on the labor involved and the availability of materials. Data from a recent study in Texas divided the costs between short-lives (Brush tepees) and long-

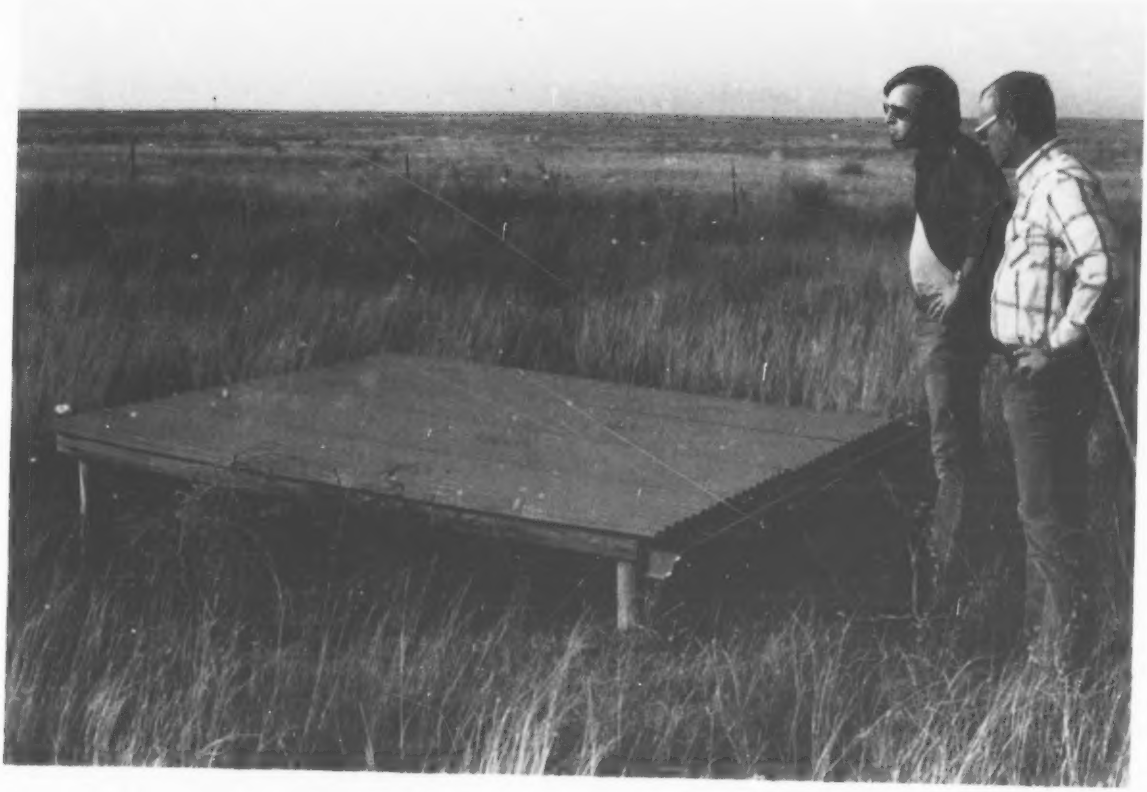

Figure 36. A shelter and guzzler made of lumber and sheet metal provide escape cover, drinking water, and grit for bobwhite and scaled quail near a playa at the Rita Blanca National Grasslands. The shelter is placed within a 16-acre fenced site where midgrasses increase the overall cover. (Photo by Nelson and Assoc., Inc., Boulder, CO).

lived structures (brush with cinder blocks and rubble). The average initial cost per pile for long-lived structures (expected life of 7 years) was $30, compared to an average cost of $4.68 for short-lived brush tepees (expected life of 3 years), according to Webb and Guthery (1982). The U. S. Forest Service reported that it cost $50 to construct a combination quail shelter and guzzler (G. Regan, Rita Blanca National Grasslands, Texline, TX, pers. comm.).

Maintenance

Shelter pile maintenance depends on the longevity of construction materials. Short term upkeep may include the addition of camouflage vegetation and repair of damage done by livestock. Long term maintenance may involve reconstruction of the shelter or the addition of sturdier materials. Debris that accumulates below brush piles may need to be removed periodically to ensure continued use of the shelter.

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DEVELOPMENT OF ISLANDS FOR ESCAPE AND NESTING COVER

Purpose

Islands can be constructed in playa lakes that provide food, shelter, and escape and nesting cover for waterfowl and other wildlife.

Description

Islands provide secure resting and nesting habitat for many waterfowl. Islands that are well designed and built increase the productive shallow-water (littoral) zone where emergent vegetation and aquatic invertebrates--insects, mollusks, and crustaceans, for example--flourish, producing abundant cover and food. Islands also increase the shoreline length to water surface ratio; this increases available breeding-pair territory by adding secure brood-rearing and loafing space.

Dragline or shovel excavation of an irrigation water storage pit within the playa basin can supply spoil material for island development (Figure 37). As an alternative, bulldozers can be used to "push up" and compact playa soil to form an island; use of scrapers generally results in a more compact and properly sloped island that will resist wave erosion. Erosion or bank cutting can be minimized with slopes that are approximately 5:1 from the base to the island dome, interrupted by an 8 to 10-ft wide, flat, submerged bank about 4 ft below the top (Eng, Jones, and Gjersing 1979). Armoring the bank with coarse materials prolongs island life. The underwater 5:1 slope creates a

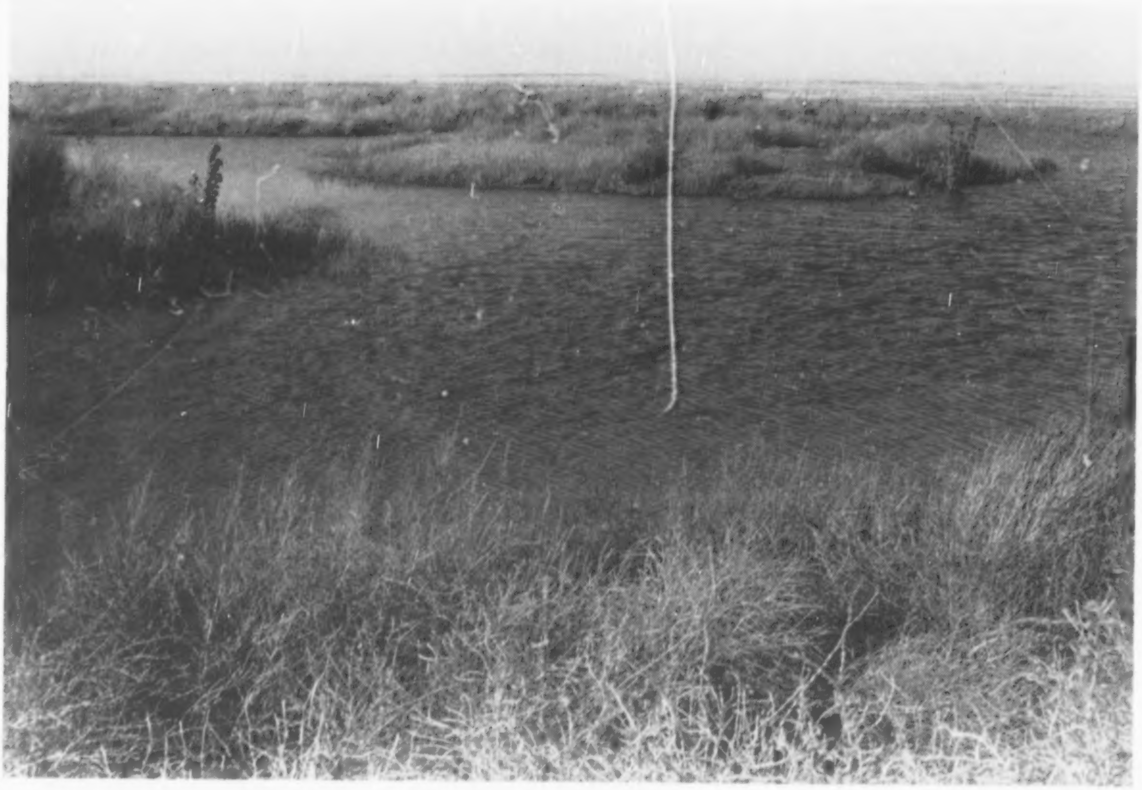

Figure 37. "Push-up" nesting islands in a rangeland playa lake, developed by the U. S. Forest Service at the Rita Blanca National grasslands, attract over-wintering birds in the Central Flyway. The islands were colonized with native invader species, principally kochia which develops into tall, robust cover. Also, waste seed from a local granary was broadcast around the shoreline, where a few cottonwoods were planted. A wind-powered ground water pumping facility is planned to help stabilize the water level. (Photo by Nelson and Assoc., Inc., Boulder, CO).

shallow shelf exposed to sunlight that will support the production of emergent vegetation and aquatic insects. Incorporating coves and other shoreline irregularities increases the "edge" effect and production of food and cover. Coves should be placed where they are protected from prevailing storm winds and designed to maintain a water depth of 1.5 ft and minimum width of 6 ft to discourage clogging by emergent vegetation (Figure 38). Islands can be positioned to minimize the area exposed to wind and wave action. They should be built to produce an area that is at least 50 ft in diameter and 1.5 to 2.0 ft above the high water mark (Eng, Jones, and Gjersing 1979). These small islands should be over 30 ft from the main shore and surrounded by water that is at least 1.5 ft deep to discourage predators and livestock. Planting some cottonwood, willow, or saltcedar will improve habitat quality.

Limitations

The main limitation of constructing nesting islands is the need to maintain a stable water level, which is practical only for playa lakes that receive large volumes of irrigation tailwater, treated sewage effluent, or feedlot runoff. Instability of water levels in playas is a natural phenomenon; design of improvements should consider the periodicity of flooding which can be tolerated, such as a 10 to 15-year frequency. The expense of managing water levels without supplemental water sources is usually very high. Unless the water level is reasonably stable during the nesting season, islands may flood or become accessible to predators, resulting in nesting losses.

Performance

Islands built to increase waterfowl resting and nesting habitat in western reservoirs have heavy use and contribute to increased production (Nelson, Horak, and Olson 1978). Geese sometimes will use even bare islands ranging from 0.03 to 0.13 surface acres in 3 to 15-acre lakes; ducks are more inclined to use small islands with some dense vegetation, especially emergent vegetation. Small islands also are used by gulls and terns. The key factors in nesting success on islands are their location in deep enough water to prevent access by terrestrial predators and water-level stability during nesting.

Costs

Island development costs primarily cover earthmoving and food and cover plantings. Earth work can be minimized if materials from playa storage pit excavations are available for use. Moving soil ranges in cost from \$0.60 to \$1.00 per yd^3, depending on degree of compaction. At a rangeland playa lake in the Rita Blanca National Grasslands, the U. S. Forest Service reported a cost of \$1,500 for earthmoving to push up a nesting island with a shoreline cove and build dikes around the lake to deepen it (G. Regan, pers. comm.).

Maintenance

The maintenance of islands constructed as waterfowl nesting and escape habitat includes repair of erosion rills or cavities and the initial care of food and cover plantings. Damage from storm wave action or extremely high

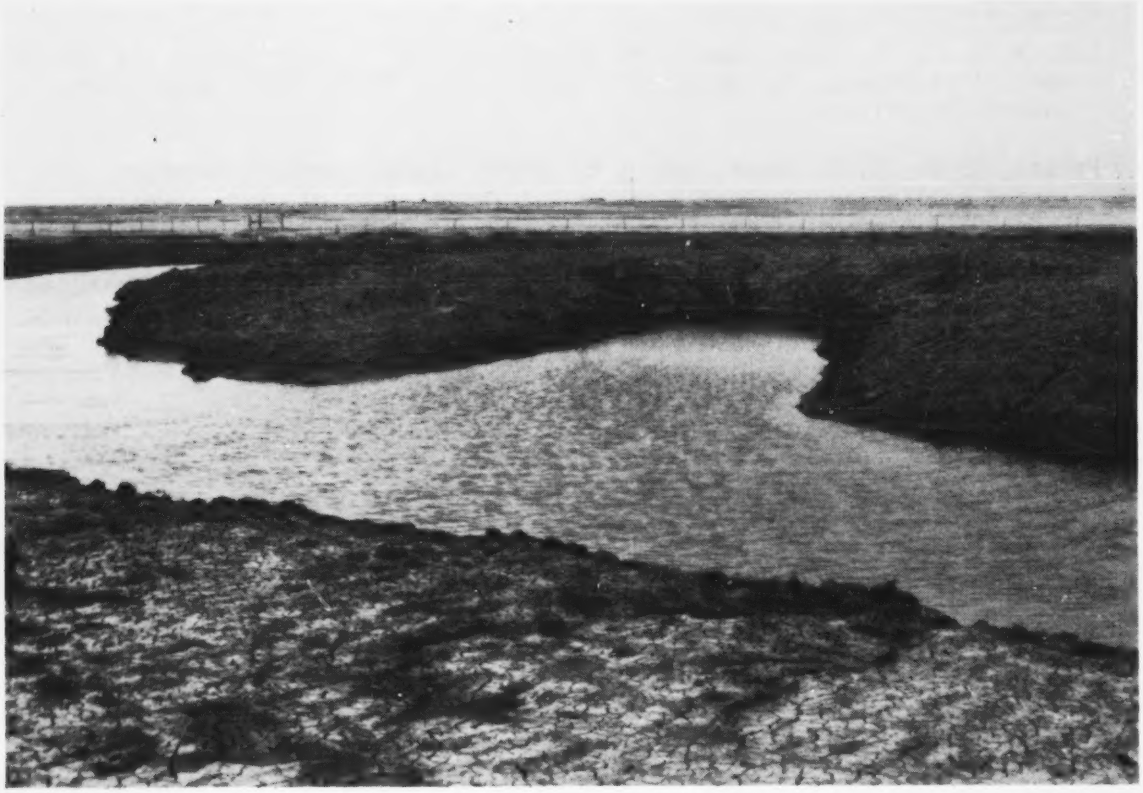

Figure 38. This nesting island, built by the U. S. Forest Service in a National grassland playa lake, has a shoreline cove oriented for maximum exposure to the sun with shelter for waterfowl and other aquatic wildlife from high storm winds. A bass fishery is planned once the water level is stabilized. (Photo by Nelson and Assoc., Inc., Boulder, CO).

water may require additional soil compaction and rock armor. Unsuccessful food and cover plantings will need to be replaced and competing vegetation removed annually for the first five years. Perennial vegetation lost by flooding will necessitate reseeding.

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RESTRICTION OF HUNTING TO MAINTAIN GAME

Purpose

Hunting may need to be restricted or otherwise managed to maintain desirable populations of wildlife at playa basins. Hunting pressure needs to be balanced with the habitat carrying capacity and reasonable hunting success in order to maintain a steady economic return from hunting.

Description

In general, hunting is a minor management concern for upland game and many species of waterfowl, but this may not be true in the Southern Great Plains. Playas concentrate both game birds and hunters because they usually exist as islands of habitat in extensively cultivated lands. Such mutual concentration raises the potential for overharvest that reduces populations below their productive size, or for overshooting that reduces wildlife use because of disturbance. Actions to preserve hunting success and long term revenues from duck, goose, sandhill crane, dove, and pheasant leases calls for controlling hunting pressure by restricting hunting times and hunter density.

A high quality hunting lease in the Southern Great Plains would encompass at least 1 mi^2 of land providing at least three playas to concentrate game (Guthery, pers. comm.). Leaseholds of irrigated croplands in this region will be worth more than those in dry land farming or rangeland areas; game populations are highest here, and playa hunting sites have more open water and shoreline cover (Figure 39). Hunting on leaseholds can begin on September 1st for mourning doves and in mid-September for teal. Hunting pressure will likely be self-limiting for these animals if seasonal leases are used; that is, the leaseholders would not be expected to exert sustained hunting pressure that would cause teal or doves to abandon a site. With day leases, however, it

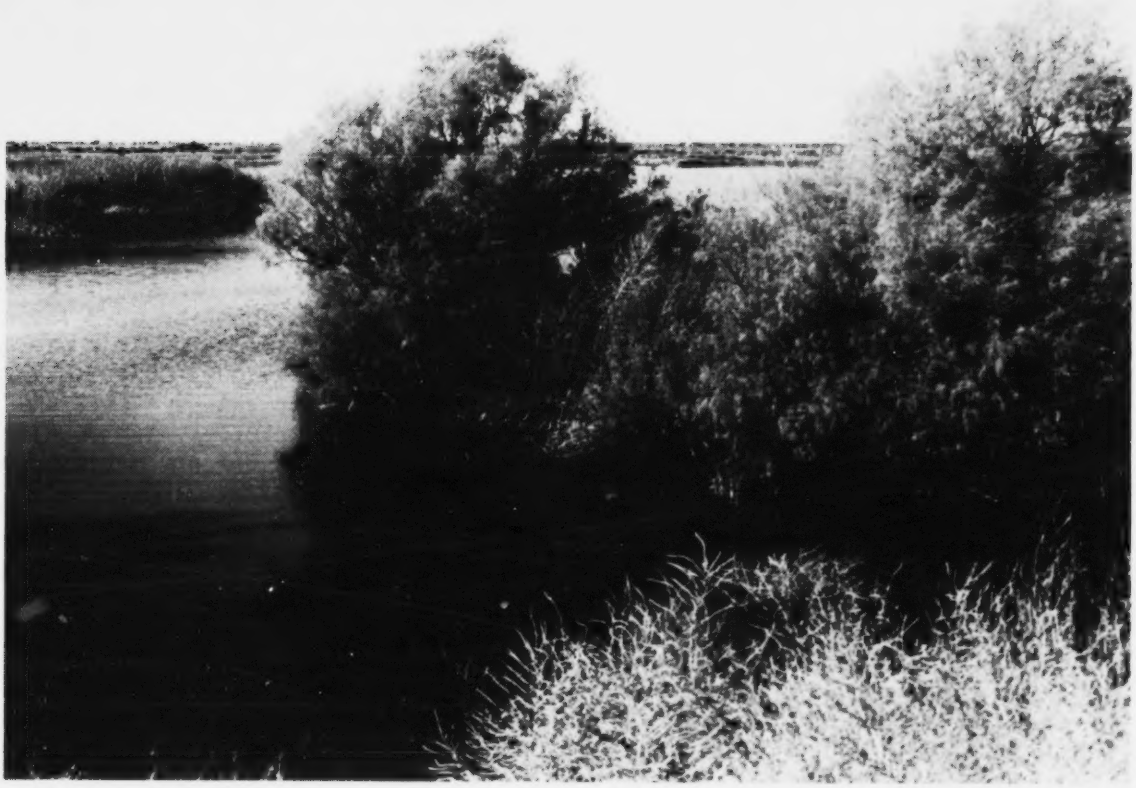

Figure 39. A good hunting site at a playa lake often combines a broad expanse of open water with some emergent vegetation and dense shoreline cover. The value of a hunting lease at this type of playa is half again more than the value of a bare open water site without hunting blinds. (Photo by Nelson and Assoc., Inc., Boulder, CO).

would be useful to alternate days or hunt only during the mornings. For doves, it is useful to establish protected areas if hunting pressure is constant and heavy. The general duck and goose season usually opens in October. The same restrictions on hunting pressure advised for doves and teal would be necessary for ducks. For geese, however, and also for sandhill cranes, denying hunter access to lakes having at least 20 surface acres will be necessary to maintain populations that provide acceptable hunting. Geese and cranes can then be harvested by pass shooting or by setting decoys in surrounding fields. For duck, goose, and crane hunting, the lease manager should limit the density of hunters on the property at any time. For instance, a range of 5 to 25 acres per hunter may be reasonable at a playa lake (Guthery, pers. comm.). Hunter density can increase with the area of surface water.

Pheasant hunting leases will require different harvest management than migratory game bird leases, particularly in Texas. In irrigated portions of the Texas High Plains, pheasant seasons should not exceed 30 days to ensure proper post-season sex ratios. The greatest hunter interest and success will occur on opening weekend, when some 70 to 80% of the total harvest of cocks is likely to take place. Hunters can be concentrated at a density of 2 per acre on playas with high pheasant populations; pheasant densities up to 5 per acre have been recorded on playas in the Texas High Plains (Figure 40). Such high hunter density will necessitate well organized hunts to ensure safety and enjoyment. Hunting success is one indicator of appropriate hunter density. For example, the density may be too high if the average effort to bag a pheasant is greater than 2 or 3 hours and 6 shots (Guthery 1979). If wildlife species become scarce or do not return to the leasehold, one possible cause may be overhunting, in which case hunting pressure should be eased. The lessor can choose between a seasonal or day lease for pheasants based purely on economic return. If the property can be leased by the season to a small group of hunters for the same price that can be obtained from a larger group of day lessees, the seasonal lease should be chosen. This will simplify management of the leasehold and hunting will be self-limiting. With day leases, however, there is a potential for overharvesting cocks; hunting should be stopped when the sex ratio approaches 9 hens per cock (Guthery, pers. comm.).

Limitations

The main limitation in restricting hunting for maintenance of game populations is any difficulty in controlling access by non-leaseholders. Conspicuously posting the property as being leased will help to prevent such intrusions. The lessees will themselves enforce trespass restrictions, which is one of the major reasons that landowners have adopted the lease system in Texas. Vigorous prosecution of apprehended trespassers will also aid in preventing trespass. Security at a hunting leasehold often can be increased through agreements with shooting clubs or conservation groups, whereby the organization furnished guides to accompany hunters, regularly patrols the site, and is given the authority by the landowners to investigate the presence of unauthorized people on the leased land.

Performance

Restricting hunting by controlling access and hunting pressure has successfully held stable game populations wherever such restrictions were

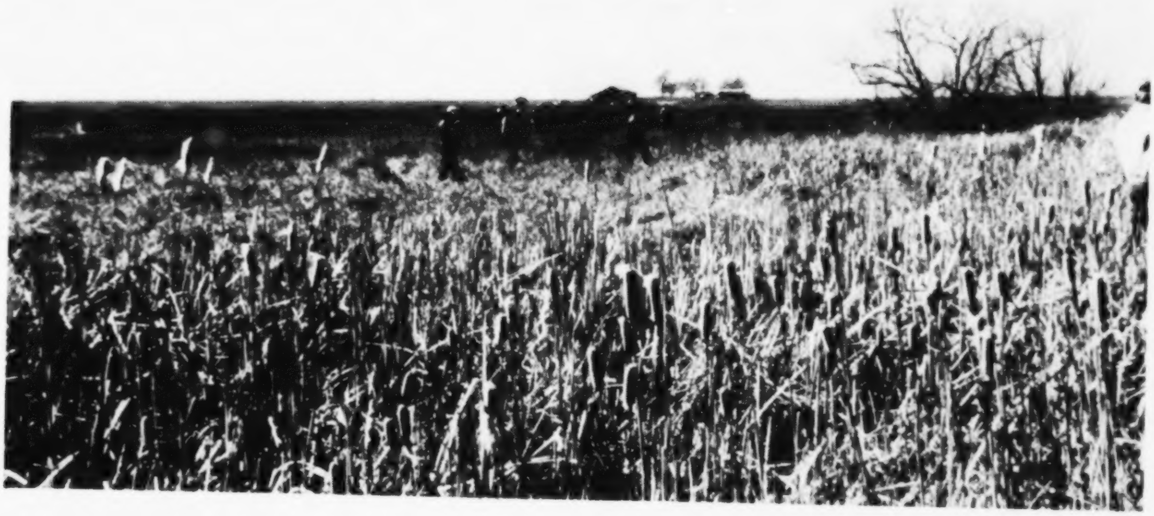

Figure 40. Information on the population level of game species, in this case, pheasants, is important in trying to balance hunting pressure with wildlife populations. Over 300 pheasants were flushed from one Texas High Plains playa similar to this one, with excellent residual winter cover, mostly cattails. (Photo by Texas Tech University, Department of Range and Wildlife Management, Lubbock.)

warranted. Without these controls, poor economic returns and poor hunting success from even the best habitat may result. Without conscientious management, the more mobile wildlife will probably leave the leasehold and other populations may decline as a result of over-harvesting, particularly if habitat conditions are marginal.

Costs

Expenses due to hunting restrictions mostly involve measures taken to control access. Locks may have to be placed on gates and signs may have to be erected. Periodic patrols of the leased property can also add costs.

Maintenance

The maintenance of features installed to restrict hunting extends to periodic inspection, repair, and replacement of gates, locks, and signs. Without close monitoring, littering and damage from vandalism will require more effort at repair and upkeep.

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STOCKING TO MAINTAIN A FISHERY

Purpose

Suitable playa lakes can be stocked and managed to provide a sport or commercial fishery. A fishery may be quite compatible with certain other uses of playa basins, such as irrigation water storage or the impoundment of treated sewage effluent or runoff from cattle feedlots.

Description

Playas that collect water but then evaporate are generally unsuitable for fish stocking; there are exceptions, however. Mosquito fish (Gambusia spp.) can be introduced on a seasonal basis to playas that hold water through the summer, although this is only a temporary solution to mosquito infestation. These or other fish populations would normally be reduced or eliminated each fall by lake drying, oxygen depletion, and heavy predation by tiger salamanders and other wildlife. Permanent fisheries require a more reliable, year-round, yet economical source of water (Figure 41). A playa lake fishery may be practical only where water is very plentiful and is supplied primarily for other purposes. Treated sewage effluent or feedlot runoff that is secondarily used for aquaculture usually is much less expensive than pumping water primarily for a fishery. Municipalities and large feedlot operators may be interested in investigating a good economic return from wastewater.

Playa lakes need to be over 10 ft deep to reduce the likelihood of oxygen depletion and rapid temperature changes from freezing and wind-induced overturning of the water. Shallow, windswept playas are frequently muddy, which reduces biological productivity and subjects the playa to rapid water-column overturning, resulting in fish kills related to large fluctuations in temperature and dissolved oxygen levels. Rapid water level decreases can concentrate predator populations and increase the vulnerability of prey species, resulting in heavy predation and changes in the population balance. This problem can be minimized by establishing windbreaks and excavating at least one-third of the playa to a minimum depth of 10 to 12 ft. Supplemental water from pumping ground water may be necessary to maintain the desired water level within the excavated portion (Figure 42). Livestock access to the lake can be restricted with fencing to reduce turbidity from the resuspension of clays and to protect shoreline vegetation.

Multispecies commercial and sport fisheries usually require intensive management to maintain desirable fish size and population balance. A single species or paired predator-prey combination are the easiest fisheries to manage in a playa lake. Stocking levels should consider the amount of fluctuation expected in the water level during the year; stocking rates should relate to the smallest water surface that is expected. A large decrease in water level after stocking a multispecies fishery may result in unanticipated predation, requiring restocking of forage species. Catfish populations tend to require restocking after a 50% harvest. In a bass-sunfish fishery, a harvest limit on bass may be imposed the first 3 years; only bass over 15 in can be kept (American Fisheries Society 1980). After 3 years, a bass fishery that supports fish larger than 12 in can be maintained by removing approximately 25, 8 to 12 in bass per acre per year; 12 to 15 in bass that are caught are released to control the sunfish population. Thereafter, it may be necessary to restock either bass or sunfish or impose catch and release restrictions on bass. Some recommended species and stocking rates for playa lake fisheries in the Southern Great Plains are presented in Table 8. Fishery management assistance is available from county extension, local U. S. Soil Conservation Service personnel, or State fish and game agency biologists.

Limitations

Several limitations affect the success of a playa lake fishery. The water supply must be reliable and not too turbid. Water-level stability and depth are very important to fish health and species balance. A playa basin modified by excavation and diking to concentrate the storage of surface runoff and tailwater collection is most likely to meet these conditions. Stocking

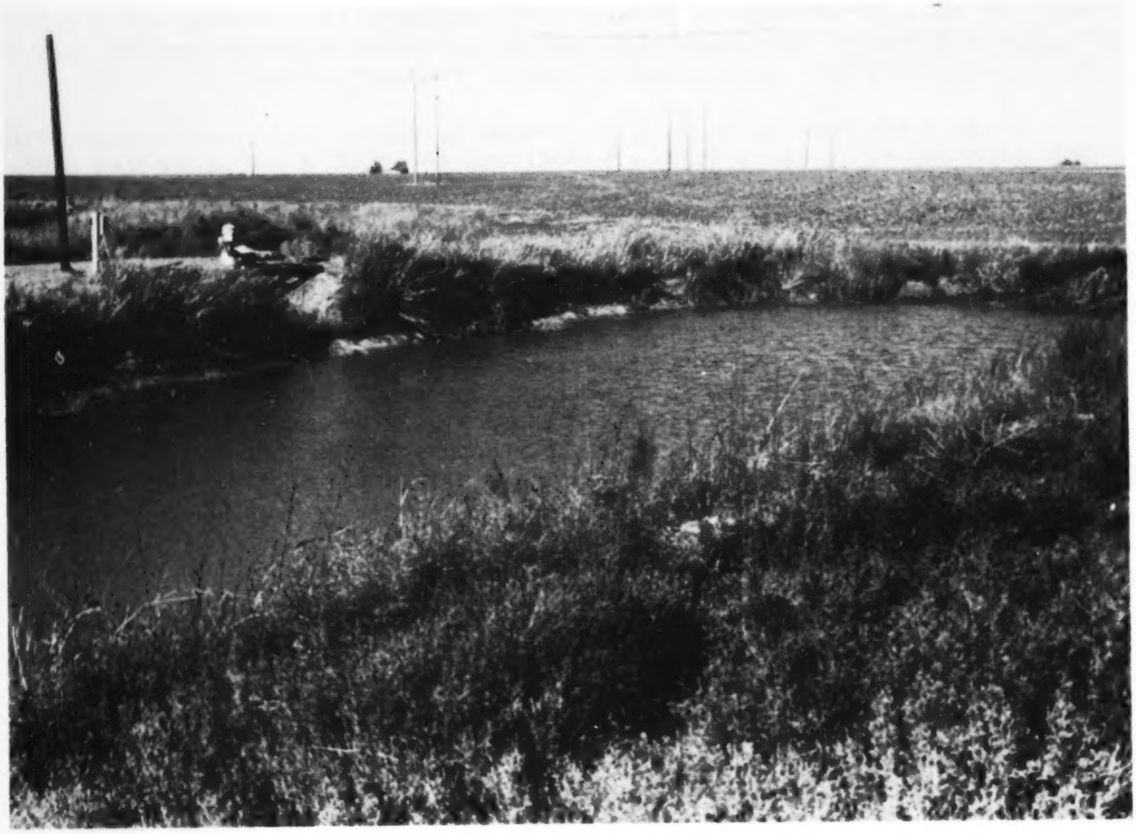

Figure 41. Rectangular irrigation water storage pits, excavated at the perimeter of a playa basin, have a good fishery potential because of the relatively reliable year-round water supply, particularly where tailwater from irrigation of winter wheat is collected. Evaporation is greatly reduced by this type of playa modification. (Photo by Nelson and Assoc., Inc., Boulder, CO).

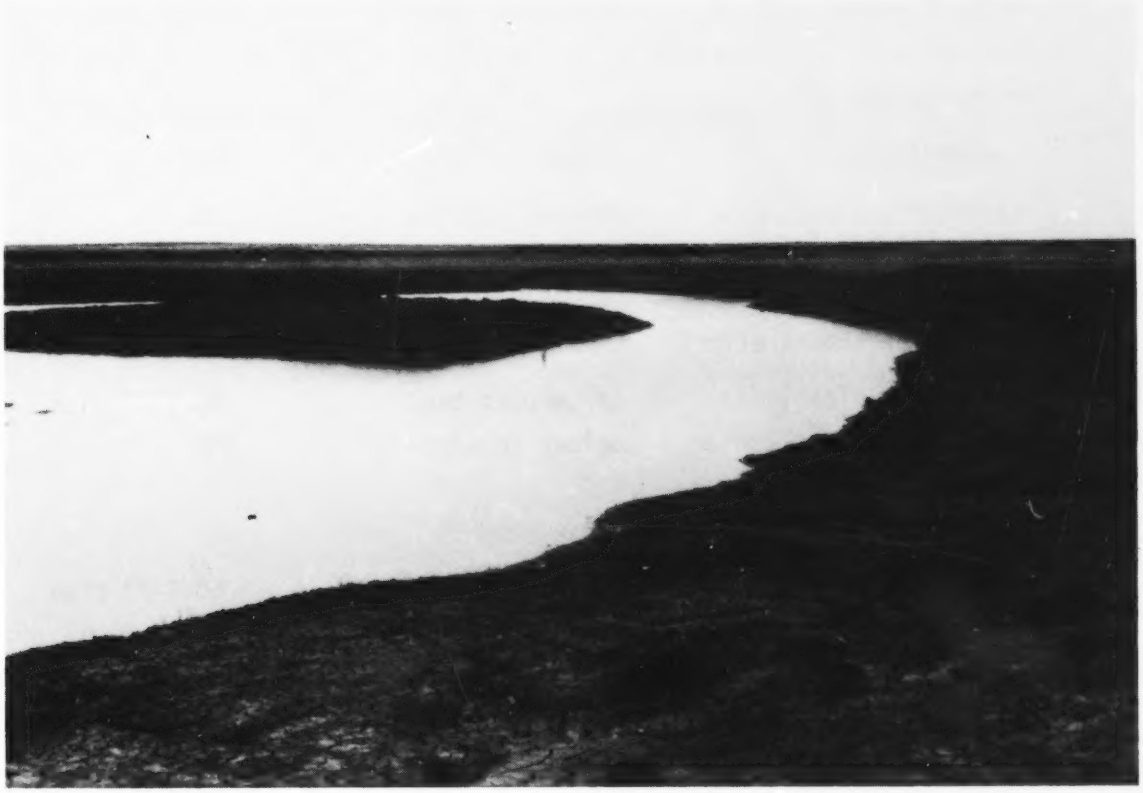

Figure 42. This playa lake in the Rita Blanca National Grasslands has been modified by deepening and building waterfowl nesting islands with the excavation spoil. The U. S. Forest Service plans to stock the lake as a bass fishery after installing a deep well and wind-powered ground water pumping station to augment the existing supply of natural runoff and irrigation tailwater. Stable water levels will benefit nesting waterfowl, as well as the fishery. (Photo by Nelson and Assoc., Inc., Boulder, CO).

Table 8. Recommended species and stocking rates for playa lake fisheries in the Southern Great Plains (American Fisheries Society 1980).

Type of playa lake	Suggested species	Stocking rate (per acre)
Low management effort		
Intermittent	Mosquito fish	500
Permanent, clear, under 5 acres (or muddy lakes)	Channel catfish	100
	Fathead minnows	500
Moderate management effort		
Permanent, clear, over 1 acre (or muddy lakes)	Largemouth bass[a]	50 1-3" fish
	Golden shiners	500
High management effort		
Permanent, clear, over 1 acre	Largemouth bass[a]	50 1-3" fish
	Channel catfish	100 4" fish
	Bluegill sunfish	250 1-3" fish
	Redear sunfish	250 1-3" fish
	Fathead minnows[b]	250
	Golden shiners[b]	250

[a] Spring stocking after other species are stocked the fall before.

[b] Optional prey species.

rates and times, harvest characteristics, disease, and predation can be factors in management success. Stockers should be certified disease-free, and fish cultured in treated sewage or feedlot effluent for human consumption should be monitored for pathogenic risk.

Performance

Some playa lakes have been successfully stocked and managed as limited sport fisheries. One lake that sustains a bass-catfish-bluegill fishery receives enough irrigation tailwater to maintain a minimum depth of 6.5 ft. This playa lake has emergent vegetation (bulrushes and smartweeds), with barnyardgrass at the shoreline. The lake is protected by a willow windbreak on the north shore. Commercial fish production has been reported for a few playas that contain permanent lakes; minnows are cultured for bait and mosquito control. No fisheries based on wastewater aquaculture have been reported, although the potential exists.

Costs

Expenses in establishing and maintaining a fishery in a playa lake depend on species, quantities, and sizes of stocked fish, the need for pumped supplemental water and basin excavation and diking, and fencing and windbreak requirements. The cost of stocker fish is extremely variable and increases with distance from the source. Average prices range from $1.00 to $1.50 per dozen for small fish and up to $0.50 and more for each larger fish (American Fisheries Society 1980). Pumping of ground water may cost $70 to $90 per acre-ft, and excavation costs may be as high as $1.00 per yd^3. Some costs may be offset by charging fishermen for access and harvest from stocked playas, and aquaculture may produce a marketable product, such as bait, forage, or game fish, for stocking elsewhere. Funds invested in playa modification for irrigation water storage may offset some fishery development costs.

Maintenance

Maintenance needed for an established playa fishery may include population management, primarily catch limits and restocking efforts, water-level management, and control of excess emergent vegetation. Dense shoreline and emergent plants may limit access by fishermen and affect predator-prey balance because of the amount of escape cover that is available.

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CONCLUDING DISCUSSIONS

There are many management options for maintaining or enhancing the value of playa wetlands for wildlife. Most direct management practices involve vegetation and/or water level manipulation in playas. Often, however, management activities on lands adjoining or surrounding playas are of equal or greater significance to wildlife than practices applied directly to playas. These include minimum or modified tillage, establishment and maintenance of shelterbelts, special right-of-way maintenance, rest/rotation grazing, innovative uses of wastewater, and other indirect management practices that increase the availability of food, water, or cover for wildlife.

Most of these management practices are multifunctional; that is, they provide a variety of values to the landowner, the community, and to the general public. At the same time they are providing improved habitat for wildlife, they are reducing soil erosion, improving water quality, reducing the need for supplemental livestock feeding, providing flood control, conserving water and reducing the need for irrigation, and cutting back on energy utilization needed for agricultural activities and other purposes.

These management practices have considerable potential for increasing economic return to the landowner. In addition, there are numerous governmental incentive programs that provide direct financial and/or technical assistance to help implement these practices. These include programs of the State Extension Service, Soil Conservation Service, Soil and Water Conservation Districts, Agricultural Stabilization and Conservation Service, and the Great Plains Conservation Program. There are also opportunities for cooperative efforts such as hunting leases that will result in mutual benefits to the landowner and to hunting clubs and conservation associations.

There are also a number of programs not described in this report that may have considerable potential for providng incentives or assistance to land owners interested in managing playa wetlands for wildlife. The State of Texas has recently enacted legislation requiring all waterfowl hunters to purchase a $5.00 waterfowl stamp. The net receipts from the sale of these stamps may be spent for the acquisition, lease, or development of waterfowl habitats in the State. This program could have direct consequences to the management of playas in the High Plains of the Texas Panhandle depending upon how it is implemented by the State.

Many other States now have special legislative programs designed to provide landowners with incentives for protecting essential fish and wildlife habitats that could be implemented in the Southern Great Plains. Iowa, Indiana, and Oregon, for example, have recently enacted legislation whereby tax exemptions may be granted to landowners for maintaining and managing wetlands, riparian streambanks, instream habitats, undisturbed grasslands and forests, and other specially designated lands and waters. These programs are carefully designed and targeted to the specific needs of the respective States. They are designed not only to provide for fish and wildlife habitat needs, but to limit the removal of property from the tax base. One of the most positive aspects of these programs is that they are conceived, sponsored, enacted, and implemented at the State or local level to fill very specific requirements identified by the public.

As this document demonstrates, much can be accomplished for wildlife in the Southern Great Plains by managing playas and adjoining uplands through the cooperative efforts of the landowner, governmental agencies, conservation associations, and the public. Management options range from the simple to the very complex; however, the needs are evident and the opportunity exists.

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Project Officer - Charles A. Segelquist

16. Abstract (Limit: 200 words)

This report describes management techniques that can be implemented on playa wetlands of the Southern Great Plains to make them more attractive to wildlife and fish. Most techniques can be implemented in conjunction with other farm and ranch operations. In fact, some techniques require the use of agricultural practices to accomplish management objectives. The report is aimed at the wildlife manager, the landowner, and the sportsman. It is the purpose of the report to suggest management options, describe management techniques, and discuss potential costs and benefits of managing playas for wildlife and fish.

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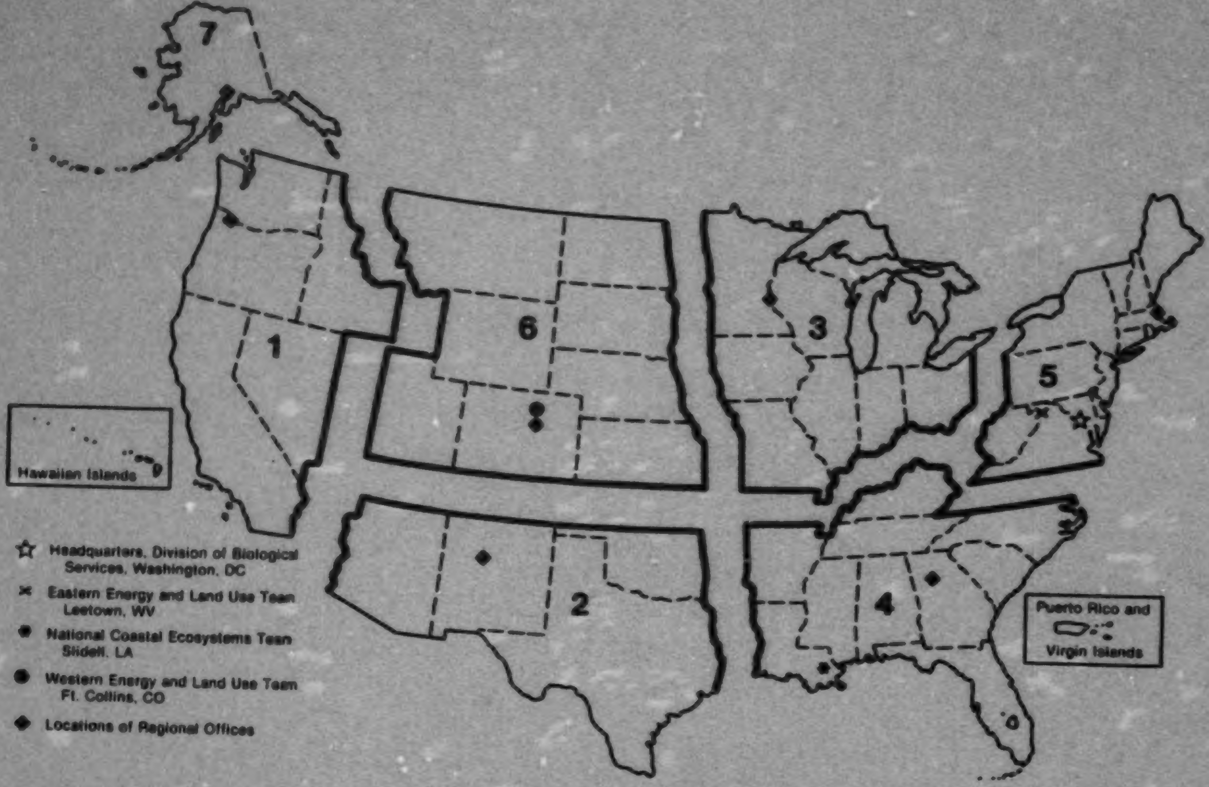
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Hawaiian Islands
Puerto Rico and Virgin Islands
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× Eastern Energy and Land Use Team Leetown, WV
● National Coastal Ecosystems Team Slidell, LA
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